Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

84C

UNITED STATES
DEPARTMENT OF AGRICULTURE
CIRCULAR No. 84

Washington, D. C. November, 1929

VITAMINS IN FOOD MATERIALS

BY
SYBIL L. SMITH
Senior Chemist
Office of Experiment Stations

LIBRARY
RECEIVED
★ NOV 11 1929 ★
U. S. Department of Agriculture

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - - Price 15 cents

CIRCULAR No. 84 NOVEMBER, 1929

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

VITAMINS IN FOOD MATERIALS

By Sybil L. Smith, *Senior Chemist, Office of Experiment Stations*, with illustrations by Hazel E. Munsell, *Senior Nutrition Chemist, Bureau of Home Economics*

CONTENTS

	Page
Vitamins defined	1
Vitamin A	1
Vitamin B	2
Vitamin F, or B_1	3
Vitamin G, or B_2	3
Vitamin C	4
Vitamin D	5
Vitamin E	5
Reported occurrence of vitamins A, B, and C in food materials	6
Selected list of references to literature reporting vitamin occurrence	14
Literature references on the occurrence of vitamin A	14
Literature references on the occurrence of vitamin B	24
Literature references on the relative distribution of vitamins F (B_1) and G (B_2)	34
Literature references on the occurrence of vitamin C	35
Selected list of references to literature reporting vitamin occurrence—Continued.	
Literature references on the occurrence of vitamin D	43
Literature references on the occurrence of vitamin E	47
Selected list of references to literature on the technic for the quantitative determination of the vitamins	48
General technic	49
Vitamin A technic	49
Vitamin A color tests	49
Vitamin B technic	50
Vitamins F (B_1) and G (B_2) technic	50
Vitamin C technic	51
Vitamin D technic	51
Vitamin D feces-reaction test	53
Vitamin E technic	54

VITAMINS DEFINED

The term "vitamin" is a group name for substances other than proteins, fats, carbohydrates, and salts, which occur in minute quantities in natural food materials. They have been found to be essential for normal nutrition and to be responsible for the prevention of various pathological conditions known collectively as "deficiency diseases." At present there are six independent vitamins the existence of which has been definitely established. In more or less alphabetical order these are as follows.

VITAMIN A

Vitamin A is otherwise known as fat-soluble A, or the antixerophthalmic, antiophthalmic, or anti-infective vitamin. It is essential for growth, well-being at all ages, and successful reproduction. A deficient supply of this vitamin leads to weakening of the body tissues and increased susceptibility to bacterial infection, particularly of the epithelial tissues. Its complete absence from the diet of experimental animals is followed by characteristic changes in these membranes throughout the body. The most conspicuous is the condition of the eye (Pl. 1, A) generally spoken of as xerophthalmia, or ophthalmia. Probably of more frequent occurrence, although not so readily detected, are abscesses at the base of the tongue. Inflammation and pus formation in the ears and sinuses, and lung, skin,

and bladder infections are of common occurrence in these animals. It has been suggested that similar inflammatory processes in the human body may be due to decreased resistance to infection resulting from deficiency of vitamin A.

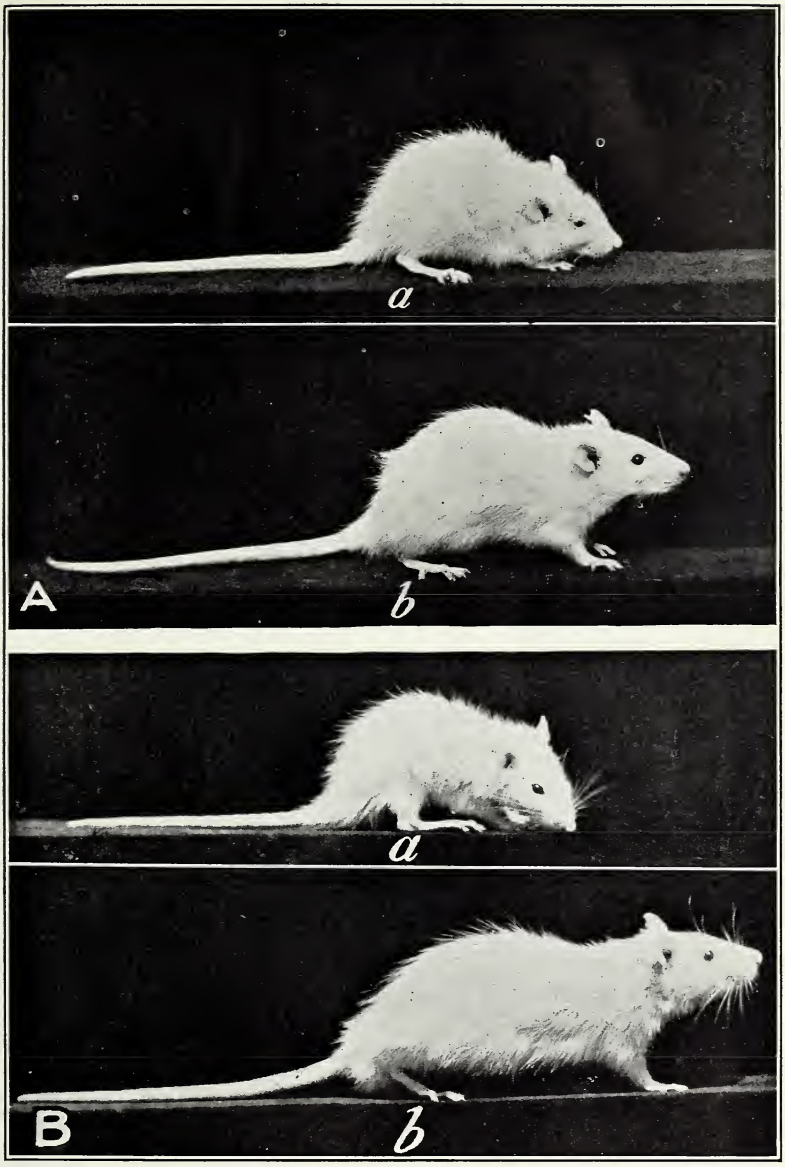
Fortunately the body has the power of storing this vitamin to a considerable extent for future needs. An abundant supply of it in early life undoubtedly safeguards the body against later infection as well as provides for present needs. This does not mean, however, that the need for vitamin A is confined to the young. An amount sufficient to support normal growth and health may still be insufficient for the added demands of reproduction and lactation and for resisting the infections more common in early adult life. Long-time feeding experiments conducted on rats have shown increasing benefits throughout succeeding generations in the continued use of liberal amounts of vitamin A.

Milk and dairy products, eggs, liver, and leafy vegetables are among the richest sources of vitamin A. While a definite connection has not been established between plant pigments and vitamin A, green or yellow vegetables are much richer in this vitamin than corresponding white varieties. Thus green lettuce is much richer than white, green asparagus than bleached, and yellow than white corn.

VITAMIN B

Vitamin B, formerly known as water-soluble B, or the growth-promoting water-soluble vitamin, is now often called the vitamin B complex. For many years the term vitamin B was used to denote what was thought to be a single substance essential for the stimulation of appetite and the promotion of growth in rats and other mammals. It was at first thought to be identical with the antineuritic vitamin which prevents and cures polyneuritis in pigeons and fowls and possibly beriberi in man. Now it is generally believed that vitamin B is made up of at least two independent vitamins. One of these is the antineuritic vitamin which is fairly easily destroyed by heat. The other is a vitamin much more stable to heat than the antineuritic vitamin and differs from it markedly in its physiological properties.

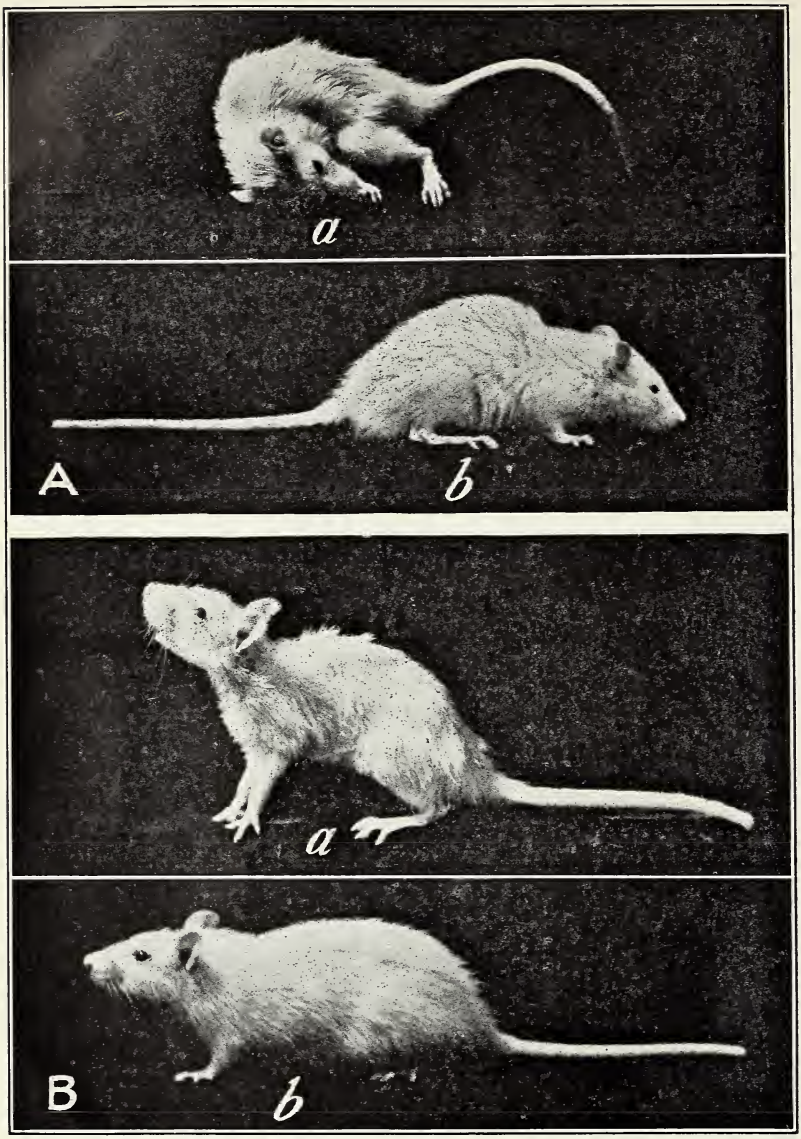
Unfortunately agreement has not been reached concerning the naming of these vitamins. British investigators have retained the name vitamin B for the mixture, or complex, and have assigned the letters B_1 and B_2 to the relatively heat-labile and heat-stable factors, respectively. In this country they are most often referred to as vitamins F and G. A committee on vitamin B nomenclature of the American Society of Biological Chemists has recently recommended that the term vitamin B be restricted to the antineuritic vitamin (B_1, or F), and that the other be known as vitamin G. Since only a few foods have been tested separately for the two vitamins now known to be contained in the original vitamin B, and information is as yet incomplete as to the physiological properties of each, it has seemed best in this circular to retain vitamin B in its original sense in the references and table of occurrence. Conforming to usage in the Experiment Station Record issued by this department and in recognition of the nomenclature at present in common usage in Great Britain, the relatively heat-labile antineuritic vitamin will be referred to as vitamin F, or B_1; the relatively heat-stable vitamin will be



EFFECT OF A DEFICIENCY OF VITAMIN A AND OF VITAMIN B IN THE DIET

A, Effect of vitamin A in the diet. From the time rat *a* was 28 days old it had no vitamin A. When photographed after 53 days it weighed only 56 grams. Note the incrustations on the eyelids typical of xerophthalmia and the slight swelling on the neck indicating the presence of an abscess. Rat *b* is a litter mate, of the same sex, and weighed 123 grams. This rat had an abundance of vitamin A in its diet and is healthy and normal.

B, Effect of vitamin B in the diet. Rat *a* shows the effect of subsisting on a diet containing no vitamin B. Rat *b* of the same sex is a litter mate and had an abundance of vitamin B in its diet. These rats were 64 days old and weighed 42 grams and 178 grams, respectively.



EFFECT OF A DEFICIENCY OF VITAMIN F (B_1) AND OF VITAMIN G (B_2) IN THE DIET

A, Effect of vitamin F (B_1) deficiency and subsequent change to an adequate diet. At 28 days of age rat *a* was given a diet containing only a minimal amount of vitamin F (B_1). It gained in weight for a time but then lost weight rapidly and developed spastic paralysis, or the typical symptoms of polyneuritis. A substance rich in vitamin F (B_1) was then administered by mouth and after about 24 hours the symptoms of paralysis had entirely disappeared, as shown in *b*.

B, Effect of vitamin G (B_2) deficiency and subsequent change to an adequate diet. When this rat was 13 weeks of age and weighed 160 grams it was given a diet containing an insufficient amount of vitamin G (B_2). Its condition 29 weeks later when it weighed only 75 grams is shown in *a*. Note the thinness of the fur, especially on the back, neck, and sides of the face. The sore areas around the eyes and mouth resemble the lesions seen in cases of human pellagra. After the first photograph was made the rat was given a diet rich in vitamin G, and three weeks later had fully recovered as shown in *b*.

referred to as vitamin G, or B_2; and the two collectively will be called vitamin B, or the vitamin B complex. When the properties and occurrence of vitamins F and G have been fully determined separately, however, there will no longer be any necessity for considering vitamin B as such.

Vitamin B in its original sense, or the vitamin B complex, has been considered to be essential for the maintenance of appetite, growth, reproduction, lactation, proper functioning of the digestive tract, and resistance to bacterial infection. Its complete absence from the diet of experimental animals is followed in a short time by loss of appetite, rapid loss of weight, and death, sometimes but not always preceded by nerve degeneration. (Pl. 1, B.) The rapidity with which symptoms of vitamin B deficiency become apparent indicates that the body has only a limited capacity for storing this vitamin. Laboratory experiments have shown that vitamin B is especially important for lactation. Lactating women must therefore have a sufficient supply of this vitamin to stimulate the secretion of milk and to transmit as much as possible in the milk to the growing young.

Vitamin B is widely distributed in plant and animal tissues. (Table 1.) Foods rich in vitamin B may be assumed to contain relatively large proportions of both F and G, whereas those deficient in vitamin B may be deficient in both F and G or in only one of the two.

VITAMIN F, or B_1

Vitamin F, B_1, or the antineuritic vitamin, is the relatively heat-labile, water-soluble vitamin essential for the prevention of polyneuritis in pigeons and fowls, a similar condition in rats, and possibly beriberi in man. Its complete absence from the diet of experimental rats is followed by loss of appetite, rapid loss in weight, and a condition of nervousness and irritability usually followed by spasms and paralytic seizures. Recovery following the administration of a rich source of this vitamin will take place with dramatic rapidity. (Pl. 2, A.)

As compared with its ability to store vitamin A, the body has only limited capacity for storage of vitamin F; therefore the diet should contain an abundance of it at all times. Probably the special need of the vitamin B complex for lactation is chiefly for vitamin F, and for this reason the diet of lactating women should be especially rich in vitamin F. As a further safeguard it is becoming customary to give babies a supplementary source of this vitamin, such as extracts of wheat or corn germ, yeast, and rice polishings.

VITAMIN G, OR B_2

Vitamin G, or B_2, sometimes known as the antipellagric vitamin, is the relatively heat-stable, water-soluble vitamin so closely associated in occurrence and properties with the antineuritic vitamin F that for many years its independent existence escaped observation. A deficiency of this vitamin from the diet of rats is followed by a rapid retardation of growth and loss in weight. Several weeks later this is followed by soreness of the eyes and mouth and occasionally of the nose. Instead of becoming nervous and irritable, as in the case of deficiency of vitamin F, the rats become weak and lethargic. In the last stages of the disease, diarrhea with blood discharges is common.

With less complete deprivation of vitamin G, skin lesions are more prominent. The fur becomes soft and dry and pulls out or is rubbed off easily, revealing cream-colored or yellow crust on the skin, usually in bilaterally symmetrical positions. (Pl. 2, B.) Occasionally there are rough red areas on the paws.

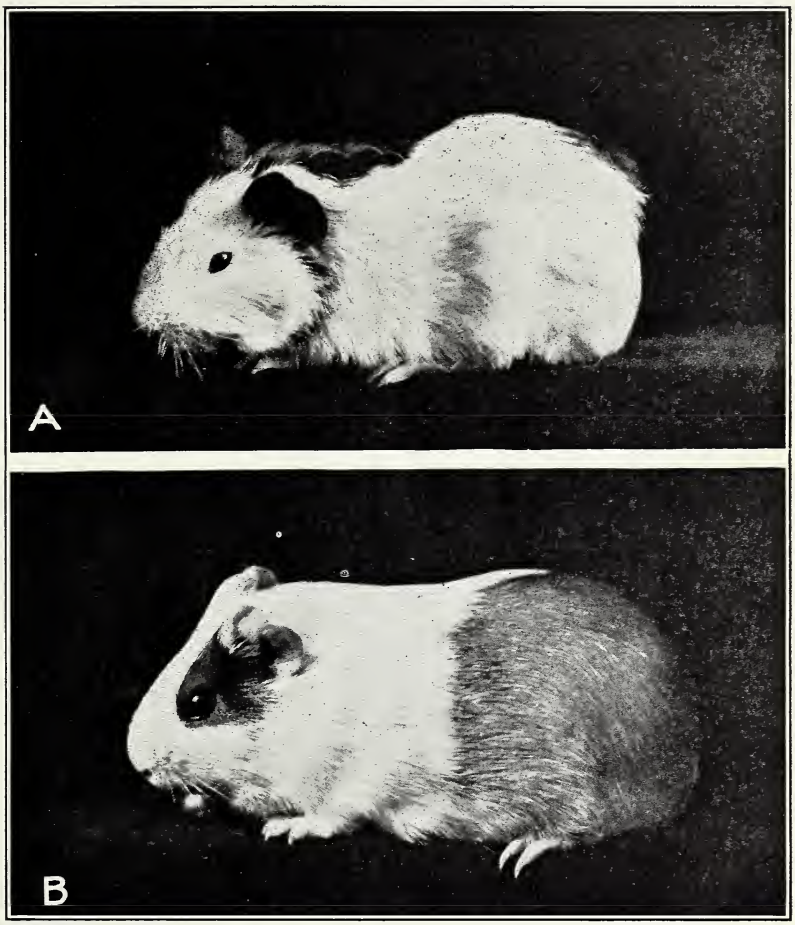
The tissues of rats succumbing to a deficiency of vitamin G show on histological examination a striking resemblance to lesions in human pellagra. On account of this similarity in lesions, external and internal, and the fact that substances relatively rich in this vitamin are effective in the prevention and cure of pellagra, many are of the opinion that pellagra is a deficiency disease caused by lack of vitamin G. The evidence on this point is not entirely convincing, but suggests that lack of this vitamin may be at least one of the predisposing causes of human pellagra.

Difficulty in obtaining a satisfactory source of vitamin F entirely free from vitamin G has delayed progress in the quantitative determination of vitamins F and G separately. So few foods have thus far been tested for the relative distribution of these two vitamins that it has been considered inadvisable to include them in the table of vitamin occurrence. Of the materials thus far tested, cereal grains appear to be relatively rich in vitamin F and poor in vitamin G, and cow's milk and green leafy vegetables to be much better sources of vitamin G than of F. The well-known value of milk and green vegetables as "protective" foods thus acquires new significance in connection with the extensive use of cereals with their higher content of vitamin F. Little work has been reported on fruits, but bananas, hitherto considered a poor source of vitamin B, have been shown to be relatively high in vitamin G and deficient in vitamin F.

Apparent discrepancies in the resistance of comparable sources of vitamin B to heat may be due to the fact that vitamin F is much less resistant to heat than is vitamin G. If the limiting factor in any source of vitamin B is vitamin F, heat treatment will apparently have a more destructive effect as judged by the older vitamin B tests than if the limiting factor is vitamin G. Canned spinach, thought to be markedly deficient in vitamin B as compared with fresh spinach, has been shown to be deficient only in vitamin F. Similar results have been obtained with evaporated milk. Both of these materials require only small supplements of a vitamin F concentrate to become effective sources of vitamin B. With the accumulated evidence that an abundance of vitamin B is essential for growth and well-being at all ages and especially for lactation, it is essential to secure favorable proportions of F and G in the diet at all times.

VITAMIN C

Vitamin C is the antiscorbutic vitamin, formerly known as water-soluble C. Complete absence of this vitamin from the diet of man and of the guinea pig and certain other animals leads to the well-known disease, scurvy. (Pl. 3, A and B.) This disease, characterized by soreness and stiffness of the joints, with a tendency to hemorrhage, soreness of the gums with loosening of the teeth, and fragility of the bones, was formerly somewhat prevalent among babies and almost universally appeared among adults in times of famine or on long sea voyages. On diets deficient but not entirely lacking in vitamin C, children become irritable and lacking in stamina, do not



EFFECT OF VITAMIN C IN THE DIET

Guinea pig A shows the typical symptoms of scurvy resulting from a diet containing no vitamin C. Note the crouched position, rough fur, and lack of vigor as compared with the healthy appearance of animal B, which received the same diet but with an abundance of vitamin C. At the beginning of the feeding experiment each animal weighed approximately 408 grams. After 22 days guinea pig A weighed 290 grams, whereas guinea pig B weighed 449 grams.

grow normally, and are less resistant to infectious diseases. Shortage of vitamin C is thought to be an important factor in the prevalence of tooth decay and of much of the so-called rheumatism in children and adults.

Cereal grains and legumes contain no appreciable amount of vitamin C, but if allowed to sprout become fairly rich in this vitamin. It is present in varying amounts in vegetables and fruits. Especially good sources are citrus fruits, raw cabbage and turnips, and tomatoes, raw, cooked, or canned. As the capacity of the body to store vitamin C is very limited and as this vitamin under certain conditions is very easily destroyed by heat and oxidation, the diet for all ages, but particularly for children, should include an abundance of vitamin-C-containing foods.

VITAMIN D

Vitamin D is termed the antirachitic vitamin. Because cod-liver oil is rich in vitamin A and is very effective in the prevention or treatment of rickets, it was at first thought that vitamin A had antirachitic properties. Later it was discovered that this property of promoting the assimilation of calcium and phosphorus and thus controlling bone development is due to another fat-soluble vitamin, to which was given the name vitamin D. Still later the favorable effects upon bone development of exposure to sunlight or ultra-violet light were correlated with the similar effects of cod-liver oil or other sources of vitamin D by the discovery that various food materials can be given antirachitic properties by suitable ultra-violet irradiation. This is due to the presence in such food materials of a compound known as ergosterol, which becomes a powerful antirachitic agent on irradiation. Ergosterol is also present in the skin, and it is believed that this favorable effect of ultra-violet irradiation or exposure of the body to sunlight is due to the formation of vitamin D from the ergosterol in the skin. At present vitamin D thus occupies a unique position among vitamins in being the only one which has been synthesized or manufactured from a definite chemical compound. Irradiated ergosterol is now used rather extensively in some countries for the prevention and cure of rickets. While rickets is the most conspicuous result of faulty metabolism of calcium and phosphorus, an abundance of vitamin D in the diet is probably also a preventive of dental caries and a means of correcting other less prominent mineral disturbances.

Feeding experiments with rats have demonstrated that vitamin D, like the other vitamins, is essential for growth and that it can be stored to a certain extent in the body. Among natural foods liver and egg yolk are probably the richest sources of vitamin D. Milk and dairy products contain it in small but appreciable amounts. Because much of the work on the quantitative occurrence of vitamin D has been carried out with such drastic rachitic diets that only large amounts of the vitamin could be detected and because almost any food can be rendered antirachitic by suitable irradiation, this vitamin is not included in the table of relative occurrence. Cod-liver oil is one of the best of all known natural sources of both vitamins A and D.

VITAMIN E

Vitamin E, the reproductive or antisterility vitamin, resembles vitamins A and D in certain chemical and physical properties but

differs from either of them in distribution. It is practically absent from cod-liver oil but present in vegetable oils. The oil of wheat embryo is one of the richest sources of vitamin E. Another good source is fresh lettuce. It is present but never highly concentrated in a great variety of animal tissues including muscle tissues and fat. Milk and butterfat contain it in small amounts.

As is indicated by its descriptive name, vitamin E is essential for reproduction but in a different way from any other dietary essential. Lack of vitamin A causes failure in ovulation. In the absence of vitamin E ovulation takes place, but there is failure of placental function, with death and resorption of the developing young. The body is probably capable of storing vitamin E to a limited extent.

REPORTED OCCURRENCE OF VITAMINS A, B, AND C IN FOOD MATERIALS

Table 1 showing the relative distribution of the vitamins, is a revision and extension of the table in a monograph of the American Chemical Society.[1] A slightly different grouping of the food materials has been followed to conform with the classification by Hunt:[2] Fruits and vegetables, foods depended on for efficient protein, cereals and cereal products, sugars, fats and fat-rich foods and miscellaneous.

As has been stated, it has been thought inadvisable to extend the table to include the antirachitic vitamin (vitamin D) or the reproductive vitamin (vitamin E), but attention is called to cod-liver oil and egg yolk as the richest natural sources of vitamin D and green lettuce and wheat embryo as particularly rich in vitamin E. Not enough information is as yet available on the relative proportions of vitamins F and G in sources of vitamin B to warrant their inclusion in the table. As rapidly as evidence is obtained by the newer methods on the relative distribution of F and G, the values of vitamin B should be disregarded.

The vitamin values assigned to the foods in this table are purely qualitative. According to the key of symbols employed, a double plus (+ +) does not indicate that the material is twice as rich in a particular vitamin as one to which a single plus (+) has been assigned, but simply that according to present knowledge it is a somewhat better source of the vitamin in question. Nor does it mean that two foods marked alike are necessarily of equal value in vitamin content. For a limited number of food materials vitamin values can now be expressed more or less quantitatively in terms of units per ounce or per gram, but it has seemed advisable to continue in this circular the admittedly qualitative + values rather than to attempt more quantitative comparisons on a much more restricted scale.

Early as well as recent work has been included in the compilation. The technic employed in much of the earlier work is open to criticism as to purity of the basal ration, previous feeding of the experimental animals, and length of the experimental period. Some of the earlier studies on vitamin A are complicated by uncertainty as to the presence or absence of vitamin D, on vitamin B by failure to prevent the rats from having access to their excreta, and on vitamin C by inadequacy of the basal ration. Distinct variations in the vitamin content of the same natural material, whether of plant or animal origin, may also

[1] SHERMAN, H. C., and SMITH, S. L. THE VITAMINS. 273 p., illus. New York. 1922.
[2] HUNT, C. L. GOOD PROPORTIONS IN THE DIET. U. S. Dept. Agr. Farmers' Bul. 1313, 23 p., illus. 1923.

occur as the result of environmental conditions and food supply. For these reasons even the qualitative values assigned may in some cases be open to question and subject to change.

Unless otherwise noted it is to be understood that the tests upon which the values given are based have been conducted upon the food material in its original state or, in the case of many of the vitamin B tests, dried at temperatures sufficiently low to prevent any possible destruction of the vitamin. Too little work has been done on the effect of various manipulative processes on the vitamin content of foods to place great dependence upon the values reported for cooked, canned, and dehydrated foods. They have been included in order to indicate in a general way the relative stability of the three vitamins and to suggest the desirability of much more research. The key to the symbols is as follows:

+ indicates that the food contains the vitamin.

+ + indicates that the food is a good source of the vitamin.

+ + + indicates that the food is an excellent source of the vitamin.

− indicates that the food contains no appreciable amount of the vitamin.

* indicates that evidence is lacking or appears insufficient.

TABLE 1.—*Relative distribution of vitamins A, B, and C*

GROUP 1. FRUITS AND VEGETABLES

Item	A	B	C
Fruits:			
Apples, canned commercially	*	*	+to++
Apples, cooked	*	*	−to+
Apples, raw, dried	*	*	−to+
Apples, raw, fresh	+	+	++
Apples, raw, stored	*	*	+
Avocados	++	++	*
Bananas, baked in skin	*	*	++
Bananas, baked without skin	*	*	+
Bananas, dried	*	*	−to+
Bananas, raw	+to++	+	++
Breadfruit	++	*	*
Cactus (pricklypear)	*	*	++
Cantaloupes	++	++	++
Cashew apples	+	*	*
Cherries, canned	++	++	*
Chicos (sapodillas)	++	*	++
Cranberry juice	*	*	+
Custard apples	−	*	*
Dates	+	++	*
Durian, white	−	*	*
Durian, yellow	+	*	*
Grapefruit (or juice), fresh	+	++	+++
Grapefruit juice, dried	*	++	+++
Grapefruit peel, outer	−to+	++	*
Grape juice, dried	*	*	−
Grapes (or juice), fresh	+	+to++	+
Guavas	*	*	++
Lemon juice, concentrated	*	*	+++
Lemon juice, dried	*	++	+++
Lemon juice, frozen, stored	*	*	+
Lemon peel, outer	+	++	−
Lemons, cold storage	*	*	+++
Lemons (or juice), fresh	+	++	+++

TABLE 1.—*Relative distribution of vitamins A, B, and C*—Continued

GROUP 1. FRUITS AND VEGETABLES—Continued

Item	A	B	C
Fruits—Continued			
Lime juice, concentrated	*	*	++
Limes (or juice)	–	*	++
Mabolo (Philippine persimmon)	*	–to+	*
Malay apples	–	*	*
Mangos, dried	*	*	+
Mangos, ripe and unripe	+	*	*
Mangosteens	–	*	*
Mulberries	*	*	+
Orange juice, concentrated	++	*	+++
Orange juice, dried	++	++	+++
Orange juice, fresh	++	++	+++
Orange juice, frozen, stored	*	*	+
Orange peel, dried and fresh	*	*	++
Orange peel, inner	*	+	*
Orange peel, outer	++	+	++
Oranges, cold storage	*	*	+++
Papaya juice	*	*	+++
Papayas	++	+	+++
Peaches, canned	+to++	+	+to++
Peaches, cooked	*	*	+
Peaches, dried	*	*	+
Peaches, raw	+to++	+	++
Pears, canned (cold-packed)	*	*	–to+
Pears, cooked	*	*	–
Pears, raw, fresh	*	+to++	+
Pears, raw, stored	*	*	+
Persimmons, Chinese	*	*	+
Pineapples, canned	++	++	++
Pineapples, raw	++	++	++
Plantains (baking bananas)	++	++	*
Prunes, dried	++	++	–
Prunes, fresh	*	++	*
Raisins	–	+	–
Raspberries, canned	*	*	++
Raspberries, raw	*	*	++
Raspberry juice, dried	*	*	–
Santol	*	+	*
Strawberries, canned and raw	+	+	+++
Tamarind, dried	*	*	+
Tangerines	*	*	+++
Vegetables:			
Artichokes, globe	++	+	*
Asparagus, bleached	–	*	*
Asparagus, green, canned	++	*	*
Asparagus, green, cooked	++	*	*
Asparagus, green, raw	++	+++	*
Bamboo shoots	*	+	*
Beans, kidney, canned	*	*	–
Beans, kidney, raw	+	++	*
Beans, mung	+	++	–
Beans, mung, sprouted, cooked	+	++	++
Beans, mung, sprouted, raw (Togi)	+	++	+++
Beans, navy, canned, baked	+	++	*
Beans, navy, cooked	*	++	*
Beans, navy, dried, raw	*	++	*
Beans, string, canned	*	+to++	–to+
Beans, string, cooked	*	+to++	*
Beans, string, raw	++	++	++

TABLE 1.—*Relative distribution of vitamins A, B, and C*—Continued

GROUP 1. FRUITS AND VEGETABLES—Continued

Item	A	B	C
Vegetables—Continued.			
Beets, leaves	++	++	*
Beets, root	−to+	+	+
Beets, stems	*	+	*
Cabbage, Chinese	*	*	++
Cabbage, head, canned	*	*	+
Cabbage, head, cooked	+	++	+
Cabbage, head, raw	+	++	+++
Cabbage, leaves, green, dried	+to++	++	+
Cabbage, leaves, green, fresh	++	++	+++
Cabbage, leaves, green, stored	*	*	−to+
Cabbage, leaves, white, fresh	−to+	++	+++
Carrots, autoclaved	+++	*	*
Carrots, canned, young	*	*	−
Carrots, cooked, old	*	++	−to+
Carrots, cooked, young	*	++	+
Carrots, raw, old	+++	++	+
Carrots, raw, young	+++	++	++
Cauliflower, canned	*	*	−
Cauliflower, cooked	*	+to++	*
Cauliflower, raw	+	++	+
Celery, leaves, bleached	+	*	*
Celery, leaves, green	++	*	*
Celery, stalks, bleached	−to+	++	*
Celery, stalks, ethylene bleached	*	++	*
Chard, Swiss, autoclaved	++	*	*
Chard, Swiss, raw	++	+to++	*
Chayotes	++	*	*
Collards, cooked	+++	+	+
Collards, raw	+++	++	++
Cowpeas, cooked	*	++	*
Cowpeas, dried	++	*	*
Cowpeas, sprouted	*	*	+++
Cucumbers	−to+	+	++
Dandelion greens	++	++	+
Dasheens (Taros)	+	+to++	+
Dasheens, steamed	+	+	+
Eggplant	+	+	*
Endive	+	*	+
Escarole	+++	*	*
Kale	++	*	*
Kohl-rabi	*	*	+
Lentils	+	++	−
Lentils, sprouted	*	*	++
Lettuce, head	+to++	++	+++
Lettuce, leaves, bleached	+	++	+++
Lettuce, leaves, green	+++	++	+++
Limu (Hawaiian algae)	+	+	−
Mushrooms, dried	−	++	−
Mushrooms, raw	−to+	*	−
Okra	*	++	*
Onions, cooked	−to+	+	+
Onions, raw	−to+	+	++
Parsley	*	++	*
Parsnips	−to+	++	*

TABLE 1.—*Relative distribution of vitamins A, B, and C*—Continued

GROUP 1. FRUITS AND VEGETABLES—Continued

Item	A	B	C
Vegetables—Continued.			
Peas, dried	+	++	*
Peas, Garbanza	*	++	*
Peas, green, canned	++	+to++	++
Peas, green, cooked	++	+to++	++
Peas, green, raw	++	++	+++
Peas, green, sprouted	−to+	*	+++
Peas, yellow	++	*	*
Peppers, green	++	++	+++
Poi (fermented steamed taros, dasheens)	+	+	+
Potatoes, baked	+	++	+to++
Potatoes, boiled 15 minutes	+	++	++
Potatoes, boiled 1 hour	+	++	+
Potatoes, peel	*	+	*
Potatoes, peeled, boiled, and dried	*	+	*
Potatoes, raw	+	++	++
Pumpkin, boiled	++	*	*
Pumpkin, dried	++	+	*
Pumpkin, raw	++	+	+
Radishes	−	++	++
Rhubarb	*	*	+
Romaine	++	++	*
Rutabaga juice	*	*	+++
Rutabaga juice, frozen, stored 15 months	*	*	−to+
Rutabaga juice, heated	*	*	++
Rutabagas, cold storage	*	*	++
Rutabagas, raw (Swedes)	+	++	+++
Sauerkraut	+	+	+to++
Soybeans	+	++	−
Soybeans, sprouted	*	*	−
Spinach, canned	+++	+	+to++
Spinach, cooked	+++	+	+to++
Spinach, dried	+++	++	*
Spinach, raw	+++	++	+++
Squash, Hubbard, autoclaved and raw	++	*	*
Sweet potatoes, autoclaved	+to++	*	*
Sweet potatoes, leaves and shoots	*	++	+
Sweet potatoes, raw	+to++	++	++
Tomato concentrate	+++	+++	+++
Tomato juice, dried	*	++	++
Tomatoes, green, canned	*	*	+
Tomatoes, green, pickled	*	*	−to+
Tomatoes, green, raw, mature	+	++	+
Tomatoes, raw, air-ripened	++	++	++
Tomatoes, raw, ethylene-ripened	++	++	++
Tomatoes, raw, vine-ripened	++	++	+++
Tomatoes, ripe, canned	++	++	++to+++
Turnip greens, cooked	+++	++	−to+
Turnip greens, raw	+++	++	++
Turnips, white	−to+	++	++
Vegetable marrow, juice	*	*	++
Watercress	+++	*	+++
Yautia, white	+	+	*
Yautia, yellow	++	++	*

TABLE 1.—*Relative distribution of vitamins A, B, and C*—Continued

GROUP 2. FOODS DEPENDED ON FOR EFFICIENT PROTEIN

Item	A	B	C
Beef muscle, lean	+	+	−to+
Brains	+	++	*
Buttermilk	+	++	−to+
Cheese, American, cheddar	++to+++	*	*
Cheese, cottage, skim	+	*	*
Cheese, limburger	++	*	*
Cheese, Swiss	+to++	*	*
Clams	+	−to+	*
Eels, dried	++	*	*
Egg white	−	−	*
Egg yolk	+++	++	*
Eggs, duck, fresh	++	*	*
Eggs, duck, salted (Pidan)	++	−	*
Eggs, hen, fresh	++	+to++	*
Eggs, hen, storage	++	*	*
Fish, fat (such as herring, salmon)	+	+	*
Fish, lean (such as cod, haddock)	−to+	+	*
Ham	−to+	++	−
Heart, pig	+	++	+
Kidney, pig	++	++	+
Lamb or mutton muscle	−to+	+	*
Liver, calf, ox, sheep	++to+++	++	*
Liver, chicken	*	*	+
Liver, fish	++to+++	*	*
Liver, pig	*	++	*
Milk, cow's, skim, dried	+	++	−to+
Milk, cow's, skim, raw	+	++	−to+
Milk, cow's, whole, condensed	+++	++	+
Milk, cow's, whole, dried	+++	++	−to+
Milk, cow's, whole, dried, irradiated	+++	*	−to+
Milk, cow's, whole, evaporated	+++	++	−to+
Milk, cow's, whole, pasteurized	+++	++	−to+
Milk, cow's, whole, raw	+++	++	+
Milk, cow's, whole, raw, irradiated	+++	*	−to+
Milk, cow's, whole, scalded	+++	++	−to+
Milk, goat's	+++	++	+
Milk, human, dried	*	+	*
Milk, human, raw	++	+	−to+
Oysters, cooked	*	+	*
Oysters, raw	++	++	+
Pork	−to+	++	*
Poultry	−to+	+	*
Roe, fish, dried and fresh	++	++	*
Salmon, canned	+	*	*
Shrimps	+	*	*
Sweetbreads	+	+	*
Toheroa (New Zealand fish)	++	*	*
Veal	−to+	+	*

GROUP 3. CEREALS AND CEREAL PRODUCTS

Adlay	*	++	*
Barley, husked	*	++	*
Barley, unhusked	+	++	−

TABLE 1.—*Relative distribution of vitamins A, B, and C*—Continued

GROUP 3. CEREALS AND CEREAL PRODUCTS—Continued

Item	A	B	C
Bread, rye	*	++	*
Bread, white, milk	+	+	−to+
Bread, white, water	*	+	−
Bread, whole-wheat, milk	++	++	−to+
Bread, whole-wheat, water	+	++	−
Corn (maize), bran	*	−to+	*
Corn (maize), white, embryo	−	++	−
Corn (maize), white, endosperm	−	−	−
Corn (maize), white, whole	+	++	−
Corn (maize), yellow, embryo	−to+	++	−
Corn (maize), yellow, endosperm	++	−	−
Corn (maize), yellow, germ meal	−	++	−
Corn (maize), yellow, gluten	++	*	−
Corn (maize), yellow, whole	++	++	−
Kaoliang, red	+	++	*
Kaoliang, white	+	++	*
Malt, green	+	++	++
Malt, kilned	*	++	−
Millet seed	+	++	*
Oat meal	−to+	++	−
Oats, embryo	*	++	−
Oats, endosperm	*	+	−
Oats, whole	−to+	++	−
Rice, endosperm	*	+	*
Rice, germ	*	++	*
Rice, polished	−	−	−
Rice polishings	*	++	*
Rice polishings, extract	*	++	*
Rice, unpolished, brown	+	++	−
Rice, wild	+	++	*
Rye, germ	++	++	−
Rye, whole	+	++	−
Wheat, bran	+	++	−
Wheat, endosperm	−	+	−
Wheat flour, white, patent	−	−to+	−
Wheat, germ	++	+++	−
Wheat, germ extract	*	+++	*
Wheat, middlings, commercial	*	++	−
Wheat, whole	+	++	−

GROUP 4. SUGARS

Glucose	−	−	−
Honey	−	−	−
Molasses	−	+	−
Sugar	−	−	−

GROUP 5. FATS AND FAT-RICH FOODS AND MISCELLANEOUS

Almond oil	−	*	*
Almonds	+	++	*
Bacon	−to+	+	*
Beechnuts	*	++	*
Beef fat	++	−	*
Beef juice	*	+	−to+
Beef kidney fat	++	*	*
Brazil nuts	+	++	*
Butter	+++	−	*
Butternuts	+	++	*
Cacao	−	*	*

TABLE 1.—*Relative distribution of vitamins A, B, and C*—Continued

GROUP 5. FATS AND FAT-RICH FOODS AND MISCELLANEOUS—Continued

Item	A	B	C
Chestnuts	*	+	*
Chocolate (*see* Cacao).			
Cocoa (*see* Cacao).			
Coconut	+	++	*
Coconut oil	−to+	−	−
Coconut press cake	+	−	*
Cod-liver oil	+++	−	−
Cod-liver oil extract	−	*	*
Corn oil, yellow, crude	+	−	−
Corn oil, yellow, refined	−	−	−
Cottonseed oil	−to+	−	−
Cream	+++	++	−to+
Eel fat	++	*	*
Filberts	*	++	*
Fish-liver oils	+++	*	*
Herring oil	++	*	*
Hickory nuts	*	++	*
Horse fat	+	−	−
Lard	−to+	−	−
Litchi nuts	−	−	*
Malt extract	*	+	−
Margarins, animal	−to++	−	−
Margarins, vegetable	−to++	−	−
Mutton fat	+	−	−
Oleo oil	+to++	−	−
Oleo stearin	+	*	*
Olive oil	−to+	−	−
Peanut oil	+	−	−
Peanuts	+	++	*
Pecans	+	++	*
Pig kidney fat	++	−	−
Pine nuts	+	+	*
Salmon oil	++	*	*
Sesame oil	−	*	*
Soybean oil	+	*	*
Tea, black	*	*	−to+
Tea, green	*	*	+
Vegetable oils, hydrogenated	−	*	*
Walnuts, English	+	++	*
Yeast	−to+	++to+++	*

SELECTED LIST OF REFERENCES TO LITERATURE REPORTING VITAMIN OCCURRENCE

As an aid to further work on the quantitative occurrence of the vitamins as well as in the interpretation of the values assigned in Table 1, a partial list of literature references has been prepared including those on vitamins D and E and the differentiation of vitamin B into F (B_1) and G (B_2). As far as possible the most recent reference has been selected if this appears authoritative and if the original article contains, as is usually the case, a review of earlier literature on the subject. In some cases it has been considered advisable to include more than one reference. For the convenience of research workers at the State agricultural experiment stations, references are included to abstracts of the literature in the Experiment Station Record.

LITERATURE REFERENCES ON THE OCCURRENCE OF VITAMIN A

Almond Oil.

(1) Osborne, T. B., and Mendel, L. B.
1914. THE INFLUENCE OF COD-LIVER OIL AND SOME OTHER FATS ON GROWTH. Jour. Biol. Chem. 17: 401–408, illus. (Abstract in Expt. Sta. Rec. 31: 560.)

Almonds.

(1) Coward, K. H., and Drummond, J. C.
1920. RESEARCHES ON THE FAT-SOLUBLE ACCESSORY SUBSTANCE. IV. NUTS AS A SOURCE OF VITAMIN A. Biochem. Jour. 14: [665]–667. (Abstract in Expt. Sta. Rec. 44: 765.)

Apples.

(1) Sherman, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., 636 p., illus. New York. (Approximations to vitamin A contents of foods, p. 458.)

Artichokes, Globe.

(1) Morgan, A. F., and Stephenson, H. D.
1923. BIOLOGICAL FOOD TESTS. III. CHANGES IN VITAMINS A AND B OF THE GLOBE ARTICHOKE DUE TO VARIOUS CANNING AND DRYING PROCESSES. Amer. Jour. Physiol. 65: 491–502, illus. (Abstract in Expt. Sta. Rec. 50: 462.)

Asparagus.

(1) Crist, J. W., and Dye, M.
1929. THE ASSOCIATION OF VITAMIN A WITH GREENNESS IN PLANT TISSUE. II. THE VITAMIN A CONTENT OF ASPARAGUS. Jour. Biol. Chem. 81: 525–532, illus. (Abstract in Expt. Sta. Rec. 61: 494.)

Avocados.

(1) Jansen, B. C. P., and Donath, W. F.
1924. THE A-VITAMIN-CONTENT OF DIFFERENT INDIAN FOODSTUFFS, AND THE VALUE OF THE PROTEINS OF THESE LATTER, AS A SUPPLEMENT TO THE PROTEINS OF RICE. Meded. Burgerl. Geneesk. Dienst Nederland. Indië 1: [46]–98, illus. (Abstract in Expt. Sta. Rec. 52: 64.)

(2) Weatherby, L. S., Youtz, J. E., and Watson, R. V.
1929. THE VITAMIN A CONTENT OF AVOCADOS. Jour. Home Econ. 21: 360–364, illus.

Bacon. *See* Apples.

Bananas.

(1) *See* Apples.

(2) Eddy, W. H., and Kellogg, M.
1927. THE PLACE OF THE BANANA IN THE DIET. Amer. Jour. Pub. Health 17: 27–35, illus. (Abstract in Expt. Sta. Rec. 56: 894.)

Barley.

(1) Steenbock, H., Kent, H. E., and Gross, E. G.
1918. THE DIETARY QUALITIES OF BARLEY. Jour. Biol. Chem. 35: 61–74, illus. (Abstract in Expt. Sta. Rec. 39: 666–667.)

Vitamin A occurrence—Continued

Beans, Kidney.
(1) SHERMAN, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., 636 p., illus. New York (Foods as sources of vitamins A, B, and C, p. 598–603.)

Beans, Mung.
(1) EMBREY, H.
1921. THE INVESTIGATION OF SOME CHINESE FOODS. PAPER 2. FEEDING EXPERIMENTS ON WHITE MICE USING MUNG BEANS, MUNG BEAN SPROUTS, RED KAOLIANG, WHITE KAOLIANG, AND CHINESE PERSIMMONS. China Med. Jour. 35: 420–447, illus.
(2) HELLER, V. G.
1927. NUTRITIVE PROPERTIES OF THE MUNG BEAN. Jour. Biol. Chem. 75: 435–442. (Abstract in Expt. Sta. Rec. 58: 387.)

Beans, Mung, Sprouted, Cooked and Raw.
(1) MILLER, C. D., and HAIR, D. B.
1928. THE VITAMIN CONTENT OF MUNG BEAN SPROUTS. Jour. Home Econ. 20: 263–271. (Abstract in Expt. Sta. Rec. 59: 192.)

Beans, Navy, Canned Baked. *See* Apples.

Beans, String.
(1) *See* Apples.
(2) QUINN, E. J., BURTIS, M. P., and MILNER, E. W.
1927. QUANTITATIVE STUDIES OF VITAMINS A, B, AND C IN GREEN PLANT TISSUES OTHER THAN LEAVES. Jour. Biol. Chem. 72: 557–563. (Abstract in Expt. Sta. Rec. 57: 293.)

Beef Fat.
(1) STEENBOCK, H., SELL, M. T., and BUELL, M. V.
1921. FAT-SOLUBLE VITAMINE. VII. THE FAT-SOLUBLE VITAMINE AND YELLOW PIGMENTATION IN ANIMAL FATS WITH SOME OBSERVATIONS ON ITS STABILITY TO SAPONIFICATION. Jour. Biol. Chem. 47: 89–109, illus. (Abstract in Expt. Sta. Rec. 46: 61.)
(2) *See* Apples.

Beef Kidney Fat.
(1) WILLIMOTT, S. G., and WOKES, F.
1927. COLOUR TESTS FOR VITAMIN A. THEIR APPLICATION TO NATURALLY OCCURRING PRODUCTS. Lancet [London] 213 (5418): 8–11. (Abstract in Expt. Sta. Rec. 57: 690–691.)

Beef Muscle.
(1) HOAGLAND, R., and SNIDER, G. G.
1925. VITAMIN A IN BEEF, PORK, AND LAMB. Jour. Agr. Research [U. S.] 31: 201–221, illus. (Abstract in Expt. Sta. Rec. 54: 390.)
(2) *See* Apples.

Beets, Leaves and Roots. *See* Apples.

Brains. *See* Beans, Kidney.

Brazil Nuts. *See* Almonds.

Bread, White, Milk. *See* Beans, Kidney.

Bread, Whole-Wheat. *See* Beans, Kidney.

Breadfruit.
(1) JANSEN, B. C. P., and DONATH, W. F.
1928. THE AMOUNT OF VITAMIN A IN INDIAN FRUITS. Meded. Dienst. Volksgezondh. Nederland. Indië 17: 126–137. (Abstract in Expt. Sta. Rec. 59: 492.)

Butter.
(1) DRUMMOND, J. C., COWARD, K. H., and WATSON, A. F.
1921. RESEARCHES ON VITAMIN A. VII. NOTES ON THE FACTORS INFLUENCING THE VALUE OF MILK AND BUTTER AS SOURCES OF VITAMIN A. Biochem. Jour. 15: [540]–552, illus. (Abstract in Expt. Sta. Rec. 46: 357–358.)
(2) JONES, J. H., STEENBOCK, H., and NELSON, M. T.
1924. FAT SOLUBLE VITAMINS. XXII. THE COMPARATIVE AMOUNTS OF VITAMIN A AND ANTIRACHITIC FACTOR IN BUTTER FAT AND COD-LIVER OIL. Jour. Metabolic Research 6: [169]–187, illus. (Abstract in Expt. Sta. Rec. 56: 490–491.)
(3) *See* Apples.

Vitamin A occurrence—Continued

Buttermilk. *See* Butter (1).
Butternuts. *See* Almonds.
Cabbage, Head. *See* Apples.
Cabbage Leaves, Green and White.
(1) STEENBOCK, H., and SELL, M. T.
1922. FAT-SOLUBLE VITAMINE. X. FURTHER OBSERVATIONS ON THE OCCURRENCE OF THE FAT-SOLUBLE VITAMINE WITH YELLOW PLANT PIGMENTS. Jour. Biol. Chem. 51: 63–76, illus. (Abstract in Expt. Sta. Rec. 47: 464–465.)
Cacao.
(1) DRUMMOND, J. C., and ZILVA, S. S.
1922. STUDIES OF THE NUTRITIVE VALUE OF THE EDIBLE OILS AND FATS. I. THE OIL-BEARING SEEDS AND CRUDE VEGETABLE OILS AND FATS. Jour. Soc. Chem. Indus. 41: 125T–127T. (Abstract in Expt. Sta. Rec. 49: 59.)
Cantaloupes.
(1) NEWTON, C. L.
1928. VITAMIN CONTENT OF CANTALOUPES, TURNIP GREENS, AND COLLARDS—PRELIMINARY REPORT. (Abstract) Jour. Home Econ. 20: 760–761.
Carrots, Autoclaved.
(1) STEENBOCK, H., and BOUTWELL, P. W.
1920. FAT-SOLUBLE VITAMINE. V. THERMOSTABILITY OF THE FAT-SOLUBLE VITAMINE IN PLANT MATERIALS. Jour. Biol. Chem. 41: 163–171, illus. (Abstract in Expt. Sta. Rec. 42: 556–557.)
Carrots, Raw.
(1) OSBORNE, T. B., and MENDEL, L. B.
1920. NUTRITIVE FACTORS IN PLANT TISSUES. IV. FAT-SOLUBLE VITAMINE. Jour. Biol. Chem. 41: 549–565, illus. (Abstract in Expt. Sta. Rec. 43: 165.)
(2) *See* Apples.
Cashew Apples. *See* Breadfruit.
Cauliflower. *See* Apples.
Celery Leaves, Bleached and Green. *See* Apples.
Celery Stalks, Bleached. *See* Apples.
Chard, Swiss, Autoclaved. *See* Carrots, Autoclaved.
Chard, Swiss, Raw.
(1) STEENBOCK, H., and GROSS, E. G.
1920. FAT-SOLUBLE VITAMINE. IV. THE FAT-SOLUBLE VITAMINE CONTENT OF GREEN PLANT TISSUES TOGETHER WITH SOME OBSERVATIONS ON THEIR WATER-SOLUBLE VITAMINE CONTENT. Jour. Biol. Chem. 41: 149–162, illus. (Abstract in Expt. Sta. Rec. 42: 556.)
Chayotes. *See* Avocados (1).
Cheese.
(1) MORGAN, A. F.
1926. BIOLOGICAL FOOD TESTS. IX. VITAMIN A IN THREE VARIETIES OF CHEESE. Amer. Jour. Physiol. 78: 11–16. (Abstract in Expt. Sta. Rec. 56: 794.)
(2) *See* Apples.
Cherries, Canned.
(1) BAILEY, M. I., and KRAMER, M. M.
1928. A QUANTITATIVE STUDY OF THE VITAMIN A CONTENT OF CHERRIES AND PEACHES. (Abstract) Jour. Home Econ. 20: 760.
Chicos (Sapodillas). *See* Avocados (1).
Chocolate. *See* Cacao.
Clams.
(1) JONES, D. B., NELSON, E. M., and MURPHY, J. C.
1928. BIOLOGICAL VALUES OF CERTAIN TYPES OF SEA FOODS. III. VITAMINS IN CLAMS. Indus. and Engin. Chem. 20: 648–652, illus. (Abstract in Expt. Sta. Rec. 59: 688.)
Cocoa. *See* Cacao.
Coconut. *See* Beans, Kidney.

Vitamin A occurrence—Continued

Coconut Oil.
(1) Ghose, S. N.
1922. THE EXAMINATION OF SOME INDIAN FOODSTUFFS FOR THEIR VITAMIN CONTENT. Biochem. Jour. 16 [35]–41. (Abstract in Expt. Sta. Rec. 47: 661.)

Coconut Press Cake.
(1) Johns, C. O., Finks, A. J., and Paul, M. S.
1919. STUDIES IN NUTRITION. I. THE NUTRITIVE VALUE OF COCONUT GLOBULIN AND COCONUT PRESS CAKE. Jour. Biol. Chem. 37: 497–502, illus. (Abstract in Expt. Sta. Rec. 41: 262–263.)
(2) *See* Avocados (1).

Cod-liver Oil.
(1) Drummond, J. C., and Zilva, S. S.
1922. THE PREPARATION OF COD-LIVER OIL AND THE EFFECT OF THE PROCESSES ON THE VITAMIN VALUE OF THE OILS. Jour. Soc. Chem. Indus. 41: 280T–284T, illus. (Abstract in Expt. Sta. Rec. 48: 64.)
(2) *See* Butter (2).
(3) Holmes, A. D., and Pigott, M. G.
1926. STUDIES OF THE VITAMIN POTENCY OF COD-LIVER OILS. XX. EFFECT OF LIGHT ON THE VITAMIN A CONTENT OF COD-LIVER OIL. Boston Med. and Surg. Jour. 195: 263–265, illus. (Abstract in Expt. Sta. Rec. 57: 894.)
(4) *See* Apples.
(5) Munsell, H. E., and Black, H.
1928. THE "ASSAY OF A SO-CALLED COD-LIVER OIL EXTRACT" FOR VITAMIN A CONTENT AND CALCIFYING PROPERTIES COMPARED TO COD-LIVER OIL. Jour. Amer. Pharm. Assoc. 17: 139–144, illus. (Abstract in Expt. Sta. Rec. 59: 492–493.)

Cod-liver Oil Extract. *See* Cod-liver Oil (5).

Collards, Cooked and Raw.
(1) Burton, G. W.
1928. QUANTITATIVE DETERMINATION OF VITAMINS A, B AND C IN COLLARDS AND TURNIP GREENS. Jour. Home Econ. 20: 35–42. (Abstract in Expt. Sta. Rec. 59: 191–192.)

Corn (Maize), White and Yellow.
(1) Steenbock, H., and Coward, K. H.
1927. FAT-SOLUBLE VITAMINS. XXVII. THE QUANTITATIVE DETERMINATION OF VITAMIN A. Jour. Biol. Chem. 72: 765–779, illus. (Abstract in Expt. Sta. Rec. 57: 392.)
(2) Rocke, C., and Hetler, R. A.
1928. THE CONTENT AND DISTRIBUTION OF VITAMIN A IN THE MILLING PRODUCTS OF YELLOW CORN. (Abstract) Jour. Home Econ. 20: 759.

Corn (Maize), Yellow, Autoclaved. *See* Carrots, Autoclaved.

Corn (Maize) Oil, Crude. *See* Cacao.

Corn (Maize) Oil, Refined. *See* Corn (Maize), White and Yellow (2).

Cottonseed Oil.
(1) Drummond, J. C., and Coward, K. H.
1920. RESEARCHES ON THE FAT-SOLUBLE ACCESSORY SUBSTANCE. V. THE NUTRITIVE VALUE OF ANIMAL AND VEGETABLE OILS AND FATS CONSIDERED IN RELATION TO THEIR COLOUR. Biochem. Jour. 14: [668]–677, illus. (Abstract in Expt. Sta. Rec. 44: 764–765.)

Cowpeas, Dried. *See* Avocados (1).

Cream. *See* Beans, Kidney.

Cucumbers. *See* Avocados (1).

Custard Apples. *See* Breadfruit.

Dandelion Greens. *See* Beans, Kidney.

Dasheens (Taros).
(1) Steenbock, H., and Gross, E. G.
1919. FAT-SOLUBLE VITAMINE. II. THE FAT-SOLUBLE VITAMINE CONTENT OF ROOTS, TOGETHER WITH SOME OBSERVATIONS ON THEIR WATER-SOLUBLE VITAMINE CONTENT. Jour. Biol. Chem. 40: 501–532, illus. (Abstract in Expt. Sta. Rec. 42: 460–461.)

Vitamin A occurrence—Continued

Dasheens (Taros)—Continued.
(2) MILLER, C. D.
1927. FOOD VALUE OF POI, TARO, AND LIMU. Bernice P. Bishop Mus. Bul. 37. 25 p., illus. (Abstract in Expt. Sta. Rec. 58: 83–84.)

Dates.
(1) SMITH, M. C.
1928. THE VITAMIN CONTENT OF THE ARIZONA DATE—PRELIMINARY REPORT. (Abstract) Jour. Home Econ. 20: 760.

Durian, White and Yellow. *See* Breadfruit.

Eel Fat.
(1) ROSENHEIM, O., and WEBSTER, T. A.
1927. THE SOURCES OF SUPPLY OF VITAMINS A AND D. Nature [London] 120: 440. (Abstract in Expt. Sta. Rec. 58: 293–294.)

Eels, Dried.
(1) SHIMODA, FUJIMAKI, and SAIKI, S.
1927. TENEUR EN VITAMINES DES PRODUITS ALIMENTAIRES JAPONAIS. Bul. Soc. Sci. Hyg. Aliment. 15: [524]–530. (Abstract in Expt. Sta. Rec. 59: 594.)

Eggplant. *See* Beans, Kidney.

Eggs, Duck.
(1) *See* Avocados (1).
(2) TSO, E.
1926. THE EFFECT OF CHEMICAL PRESERVATION OF EGGS UPON THE STABILITY OF THEIR VITAMIN CONTENTS. Biochem. Jour. 20: [17]–22, illus. (Abstract in Expt. Sta. Rec. 55: 594.)

Eggs, Hen.
(1) JONES, D. B., MURPHY, J. C., and MOELLER, O.
1925. THE EFFECT OF LONG-CONTINUED STORAGE AT LOW TEMPERATURE ON THE VITAMIN-A CONTENT OF EGGS. Amer. Jour. Physiol. 71: 265–273, illus. (Abstract in Expt. Sta. Rec. 52: 664.)
(2) MURPHY, J. C., and JONES, D. B.
1925. VITAMIN A CONTENT OF FRESH EGGS. Jour. Agr. Research [U. S.] (1924) 29: 253–257, illus. (Abstract in Expt. Sta. Rec. 52: 664.)
(3) *See* Apples.

Endive. *See* Beans, Kidney.

Escarole. *See* Beans, Kidney.

Fish.
(1) DRUMMOND, J. C.
1918. THE NUTRITIVE VALUE OF CERTAIN FISH. Jour. Physiol. 52: [95]–109, illus. (Abstract in Expt. Sta. Rec. 40: 66.)

Fish-liver Oils.
(1) ZILVA, S. S., and DRUMMOND, J. C.
1922. FISH-LIVER OILS AND OTHER HIGHLY POTENT SOURCES OF VITAMIN A. Lancet [London] 202: 1243. (Abstract in Expt. Sta. Rec. 47: 768–769.)

Fish Roe.
(1) HJORT, J.
1922. OBSERVATIONS ON THE DISTRIBUTION OF FAT-SOLUBLE VITAMINES IN MARINE ANIMALS AND PLANTS. Roy. Soc. [London], Proc., Ser. B, 93: 440–449, illus. (Abstract in Expt. Sta. Rec. 47: 661–662.)

Glucose. *See* Beans, Kidney.

Grapefruit and Grapefruit Juice.
(1) MORGAN, A. F., and CHANEY, M. S.
1924. BIOLOGICAL FOOD TESTS. VI. FURTHER EXPERIMENTS UPON THE VITAMIN A AND B CONTENT OF CITRUS FRUIT PRODUCTS. Amer. Jour. Physiol. 68: 397–406, illus. (Abstract in Expt. Sta. Rec. 51: 666.)
(2) *See* Breadfruit.

Grapefruit Peel.
(1) WILLIMOTT, S. G., and WOKES, F.
1926. VITAMINS AND OTHER CONSTITUENTS OF GRAPE-FRUIT RIND. Biochem. Jour. 20: [1299]–1305, illus. (Abstract in Expt. Sta. Rec. 56: 409–410.)

Vitamin A occurrence—Continued

Grapes. *See* Apples.
Ham. *See* Beef Muscle (1).
Heart, Pig.
(1) Osborne, T. B., and Mendel, L. B.
1918. NUTRITIVE FACTORS IN ANIMAL TISSUES. II. Jour. Biol. Chem. 34: 17–27, illus. (Abstract in Expt. Sta. Rec. 39: 873.)
Herring Oil. *See* Fish Roe.
Honey.
(1) Kifer, H. B., and Munsell, H. E.
1929. VITAMIN CONTENT OF HONEY AND HONEYCOMB. Jour. Agr. Research [U. S.] 39: 355–366, illus.
Horse Fat. *See* Cottonseed Oil.
Kale. *See* Beans, Kidney.
Kidney, Pig. *See* Heart, Pig.
Lamb Muscle. *See* Beef Muscle (1).
Lard.
(1) Drummond, J. C., Golding, J., Zilva, S. S., and Coward, K. H.
1920. THE NUTRITIVE VALUE OF LARD. Biochem. Jour. 14 [742]–753, illus. (Abstract in Expt. Sta. Rec. 45: 566–567.)
(2) Mallon, M. G., and Clark, M.
1922. VITAMIN A CONTENT OF LARD OBTAINED FROM HOGS ON A CONTROL RATION. Jour. Biol. Chem. 54: 763–766. (Abstract in Expt. Sta. Rec. 49: 59–60.)
Lemon Juice. *See* Apples.
Lemon Peel.
(1) Willimott, S. G., and Wokes, F.
1927. SOME CONSTITUENTS OF CITRUS FRUITS. Pharm. Jour. and Pharm. [London] (ser. 4, v. 64) 118: 770–773, illus. (Abstract in Expt. Sta. Rec. 59: 93.)
Lentils.
(1) Jones, D. B., and Murphy, J. C.
1924. CYSTINE DEFICIENCY AND VITAMIN CONTENT OF THE LENTIL, LENS ESCULENTA MOENCH. Jour. Biol. Chem. 59: 243–253, illus. (Abstract in Expt. Sta. Rec. 51: 665–666.)
Lettuce.
(1) *See* Apples.
(2) Dye, M., Medlock, O. C., and Crist, J. W.
1927. THE ASSOCIATION OF VITAMIN A WITH GREENNESS IN PLANT TISSUE. I. THE RELATIVE VITAMIN A CONTENT OF HEAD AND LEAF LETTUCE. Jour. Biol. Chem. 74: 95–106, illus. (Abstract in Expt. Sta. Rec. 57: 895.)
Limes and Lime Juice. *See* Breadfruit.
Limu. *See* Dasheens (2).
Litchi Nuts.
(1) Smith, A. H., and Sah, P. P. T.
1927. VITAMINS A AND B IN THE CHINESE LITCHI NUT. Soc. Expt. Biol. and Med. Proc. 25: 63–64. (Abstract in Expt. Sta. Rec. 58: 691.)
Liver, Calf, Ox, Sheep. *See* Eel Fat.
Liver, Fish. *See* Fish-liver Oils.
Malay Apples. *See* Breadfruit.
Malt, Green. *See* Beans, Kidney.
Mangos, Ripe and Unripe. *See* Breadfruit.
Mangosteens. *See* Breadfruit.
Margarins, Animal and Vegetable.
(1) Halliburton, W. D., and Drummond, J. C.
1917. THE NUTRITIVE VALUE OF MARGARINES AND BUTTER SUBSTITUTES WITH REFERENCE TO THEIR CONTENT OF THE FAT-SOLUBLE ACCESSORY GROWTH SUBSTANCE. Jour. Physiol. 51: [235]–251, illus. (Abstract in Expt. Sta. Rec. 38: 265.)
Milk, Cow's, Skim, Dried.
(1) Sherman, H. C., MacLeod, F. L., and Kramer, M. M.
1920. PRELIMINARY EXPERIMENTS WITH THE FAT-SOLUBLE VITAMINE (VITAMINE A). Soc. Expt. Biol. and Med. Proc. 18: 41–43. (Abstract in Expt. Sta. Rec. 45: 366.)
Milk, Cow's, Skim, Raw. *See* Beans, Kidney.
Milk, Cow's, Whole, Condensed. *See* Beans, Kidney.

Vitamin A occurrence—Continued

Milk, Cow's, Whole, Dried.
(1) Sherman, H. C., Rouse, M. E., Allen, B., and Woods, E.
1921. growth and reproduction upon simplified food supply. i. Jour. Biol. Chem. 46: 503–519, illus. (Abstract in Expt. Sta. Rec. 45: 864.)
(2) *See* Apples.
Milk, Cow's, Whole, Dried, Irradiated.
(1) Supplee, G. C., and Dow, O. D.
1927. vitamin a potency of irradiated milk. Jour. Biol. Chem. 75: 227–239, illus. (Abstract in Expt. Sta. Rec. 58: 295.)
Milk, Cow's, Whole, Evaporated.
(1) Dutcher, R. A., Honeywell, H. E., and Dahle, C. D.
1927. vitamin studies. xvi. vitamin a in evaporated milks made by vacuum and aeration methods. Jour. Biol. Chem. 75: 85–94, illus. (Abstract in Expt. Sta. Rec. 58: 294–295.)
Milk, Cow's, Whole, Pasteurized. *See* Milk, Cow's, Whole, Evaporated.
Milk, Cow's, Whole, Raw.
(1) *See* Butter (1).
(2) *See* Apples.
(3) *See* Milk, Cow's, Whole, Evaporated.
(4) Outhouse, J., Macy, I. G., Brekke, V., and Graham, A.
1927. human milk studies. iv. a note on the vitamin a and b content of cow's milk. Jour. Biol. Chem. 73: 203–208, illus. (Abstract in Expt. Sta. Rec. 57: 390–391.)
Milk, Cow's, Whole, Raw, Irradiated. *See* Milk, Cow's, Whole, Dried.
Milk, Cow's, Whole, Scalded. *See* Beans, Kidney.
Milk, Goat's.
United States Department of Agriculture, Bureau of Animal Industry, Animal Husbandry Division. (Unpublished.)
Milk, Human. *See* Milk, Cow's, Whole, Raw (4).
Millet.
(1) Steenbock, H., Sell, M. T., and Jones, J. H.
1923. fat-soluble vitamine. xii. the fat-soluble vitamine content of millets. Jour. Biol. Chem. 56: 345–354, illus. (Abstract in Expt. Sta. Rec. 50: 364.)
Molasses. *See* Beans, Kidney.
Mushrooms, Dried.
(1) Hara, S.
1923. über den vitamingehalt verschiedener speisepilze. Biochem. Ztschr. 142: [79]–100, illus. (Abstract in Expt. Sta. Rec. 50: 856.)
Mushrooms, Raw.
(1) Coward, K. H., and Drummond, J. C.
1921. the formation of vitamin a in living plant tissues. Biochem. Jour. 15: [530]–539, illus. (Abstract in Expt. Sta. Rec. 46: 356.)
Mutton. *See* Beef Muscle (1).
Mutton Fat. *See* Cottonseed Oil.
Oatmeal, or Rolled Oats. *See* Apples.
Oats. *See* Corn (Maize), White and Yellow (1).
Oleo Oil and Stearin.
(1) Hoagland, R., and Snider, G. G.
1926. vitamin a in oleo oil and oleo stearin. Jour. Agr. Research [U. S.] 32: 397–416, illus. (Abstract in Expt. Sta. Rec. 55: 192.)
Olive Oil. *See* Apples.
Onions, Cooked. *See* Beans, Kidney.
Onions, Raw.
(1) Hume, E. M.
1921. comparison of the growth-promoting properties for guinea-pigs of certain diets, consisting of natural food-stuffs. Biochem. Jour. 15: [30]–48. (Abstract in Expt. Sta. Rec. 45: 866.)

Vitamin A occurrence—Continued

Orange Juice, Concentrated.
(1) *See* Lemon Peel.
(2) WILLIMOTT, S. G.
1928. THE VITAMINS OF COMMERCIALLY CONCENTRATED ORANGE JUICE. Biochem. Jour. 22: [535]–544, illus. (Abstract in Expt. Sta. Rec. 60: 93.)

Orange Juice, Dried.
(1) OSBORNE, T. B., and MENDEL, L. B.
1922. VITAMIN A IN ORANGES. Soc. Expt. Biol. and Med. Proc. 19: 187–188. (Abstract in Expt. Sta. Rec. 47: 465.)
(2) *See* Apples.

Orange Juice, Fresh.
(1) WILLIMOTT, S. G.
1928. THE VITAMINS OF ORANGE JUICE. Biochem. Jour. 22: [67]–76, illus. (Abstract in Expt. Sta. Rec. 59: 94.)

Orange Peel.
(1) WILLIMOTT, S. G., and WOKES, F.
1927. SOME CONSTITUENTS OF CITRUS FRUITS. Pharm. Jour. and and Pharm. [London] (ser. 4, v. 64) 118: 770–773, illus. (Abstract in Expt. Sta. Rec. 59: 93.)

Oysters.
(1) JONES, D. B., MURPHY, J. C., and NELSON, E. M.
1928. BIOLOGICAL VALUES OF CERTAIN TYPES OF SEA FOOD. II. VITAMINS IN OYSTERS (OSTREA VIRGINICA). Indus. and Engin. Chem. 20: 205–210, illus. (Abstract in Expt. Sta. Rec. 59: 95.)

Papayas.
(1) *See* Avocados (1).
(2) MILLER, C. D.
1926. THE VITAMINS (A, B, AND C) OF PAPAYA. Biochem. Jour. 20: [515]–518. (Abstract in Expt. Sta. Rec. 56: 87.)

Parsnips. *See* Dasheens (1).

Peaches, Canned.
(1) KOHMAN, E. F., EDDY, W. H., CARLSSON, V., and HALLIDAY, N.
1926. VITAMINS IN CANNED FOODS. V. PEACHES. Indus. and Engin. Chem. 18: 302–303, illus. (Abstract in Expt. Sta. Rec. 55: 793–794.)

Peaches, Raw. *See* Cantaloupes.

Peanut Oil. *See* Cacao.

Peanuts. *See* Almonds.

Peas, Dried.
(1) MCCOLLUM, E. V., SIMMONDS, N., and PARSONS, H. T.
1919. THE DIETARY PROPERTIES OF THE PEA (VICIA SATIVA). Jour. Biol. Chem. 37: 287–301, illus. (Abstract in Expt. Sta. Rec. 40: 762.)

Peas, Green, Canned, Cooked, and Raw.
(1) EDDY, W. H., KOHMAN, E. F., and CARLSSON, V.
1926. VITAMINS IN CANNED FOODS. IV. GREEN PEAS. Indus. and Engin. Chem. 18: 85–89, illus. (Abstract in Expt. Sta. Rec. 55: 793–794.)
(2) DYE, M., and HERSHEY, R.
1928. THE EFFECT OF CANNING ON THE VITAMIN A AND B CONTENT OF PEAS—(PRELIMINARY REPORT). (Abstract) Jour. Home Econ. 20: 761–762.

Peas, Green, Raw.
(1) STEENBOCK, H., SELL, M. T., and BOUTWELL, P. W.
1921. FAT-SOLUBLE VITAMINE. VIII. THE FAT-SOLUBLE VITAMINE CONTENT OF PEAS IN RELATION TO THEIR PIGMENTATION. Jour. Biol. Chem. 47: 303–308, illus. (Abstract in Expt. Sta. Rec. 46: 257.)
(2) *See* Apples.

Peas, Sprouted.
(1) *See* Onions, Raw.
(2) *See* Beans, Kidney.

Peas, Yellow. *See* Peas, Green, Raw (1).

Vitamin A occurrence—Continued

Pecans.
(1) SALMON, W. D., and LIVINGSTON, C. W.
1925. VITAMINS A AND B IN THE PECAN NUT. Jour. Home Econ. 17: 129–135, illus. (Abstract in Expt. Sta. Rec. 54: 90.)

Peppers, Green. *See* Beans, String (2).

Pig Kidney Fat. *See* Lard (1).

Pineapples, Canned and Raw.
(1) MILLER, C. D.
1924. VITAMINS A AND B IN FRESH AND CANNED PINEAPPLE. Jour. Home Econ. 16: 18–26, illus. (Abstract in Expt. Sta. Rec. 51: 167.)

Pine Nuts. *See* Beans, Kidney.

Plantains (Baking Bananas).
(1) COOK, D. H.
1927. VITAMIN STUDIES IN PORTO RICO. Porto Rico Health Rev. 2 (11): 22–23. (Abstract in Expt. Sta. Rec. 57: 690.)

Poi. *See* Dasheens (2).

Pork.
(1) WRIGHT, A. M.
1923. THE PRESENCE OF VITAMIN A IN FROZEN PORK. Jour. Soc. Chem. Indus. 42: 509T. (Abstract in Expt. Sta. Rec. 51: 268–269.)
(2) *See* Beef Muscle (1).
(3) *See* Apples.

Potatoes, Baked. *See* Apples.

Potatoes, Raw. *See* Dasheens (1).

Poultry.
(1) HOAGLAND, R., and LEE, A. R.
1926. VITAMIN A IN POULTRY FLESH AND FAT. Jour. Agr. Research [U. S.] 33: 29–40, illus. (Abstract in Expt. Sta. Rec. 55: 593.)

Prunes, Dried. *See* Beans, Kidney.

Pumpkin.
(1) MORGAN, A. F., and FRANCIS, L. D.
1924. BIOLOGICAL FOOD TESTS. VII. THE VITAMIN A AND B CONTENT OF FRESH AND DEHYDRATED PUMPKIN. Amer. Jour. Physiol. 69: 67–77, illus. (Abstract in Expt. Sta. Rec. 52: 762.)
(2) *See* Avocados (1).

Radishes.
(1) MORGAN, A. F.
1924. BIOLOGICAL FOOD TESTS. VIII. VITAMINS A AND B IN RADISH. Amer. Jour. Physiol. 69: 634–637, illus. (Abstract in Expt. Sta. Rec. 53: 62.)

Raisins.
(1) DUTCHER, R. A., and OUTHOUSE, J.
1923. THE VITAMIN CONTENT OF RAISINS AND RAISIN BY-PRODUCTS. Penn. Agr. Expt. Sta. Bul. 181: 18. (Abstract in Expt. Sta. Rec. 50: 463.)

Rice.
(1) GUERRERO, L. E., and CONCEPCION, I.
1920. XEROPHTHALMIA IN FOWLS FED ON POLISHED RICE AND ITS CLINICAL IMPORTANCE. Philippine Jour. Sci. 17: 99–103. (Abstract in Expt. Sta. Rec. 45: 669.)
(2) *See* Avocados (1).

Rice, Wild.
(1) KENNEDY, C.
1924. THE NUTRITIVE PROPERTIES OF WILD RICE (ZIZANIA AQUATICA). Jour. Agr. Research [U. S.] 27: 219–224, illus. (Abstract in Expt. Sta. Rec. 51: 163.)

Roe, Cod and Herring. *See* Fish Roe.

Romaine. *See* Beans, Kidney.

Rutabagas.
(1) SCHEUNERT, A.
1927. ÜBER DEN VITAMINGEHALT DER FÜR DIE FÜTTERUNG WICHTIGEN RÜBENARTEN. Zuchtungskunde 2: 264–278, illus.

Vitamin A occurrence—Continued

Rye, Germ.
(1) Scheunert, A.
1927. Über den gehalt von weizen-und roggenkeimen an vitaminen. Biochem. Ztschr. 183: [113]–121, illus. (Abstract in Expt. Sta. Rec. 58: 87.)

Rye, Whole. *See* Beans, Kidney.

Salmon, Canned. *See* Beans, Kidney.

Salmon Oil.
(1) Davis, D. E., and Beach, J. R.
1926. A study of the relative value of certain root crops and salmon oil as sources of vitamin A for poultry. Calif. Agr. Expt. Sta. Bul. 412, 15 p. (Abstract in Expt. Sta. Rec. 56: 373.)

Sauerkraut. *See* Beans, Kidney.

Sesame Oil.
(1) Delf, E. M.
1924. On the properties of certain S. African oils with respect to their content of vitamin A. Biochem. Jour. 18: [93]–100, illus. (Abstract in Expt. Sta. Rec. 51: 565.)

Shrimps. *See* Fish Roe.

Soybean Oil. *See* Cacao.

Soybeans.
(1) Osborne, T. B., and Mendel, L. B.
1917. The use of soy bean as food. Jour. Biol. Chem. 32: 369–387, illus. (Abstract in Expt. Sta. Rec. 39: 667.)
(2) *See* Avocados (1).

Spinach, Canned, Cooked, and Dried.
(1) Eddy, W. H., Kohman, E. F., and Carlsson, V.
1925. Vitamins in canned foods. III. canned spinach. Indus. and Engin. Chem. 17: 69–74, illus. (Abstract in Expt. Sta. Rec. 53: 764–765.)

Spinach, Raw. *See* Apples.

Squash, Hubbard. *See* Carrots, Autoclaved.

Strawberries, Canned and Raw.
(1) Kohman, E. F., Eddy, W. H., and Halliday, N.
1928. Vitamins in canned foods. VI. strawberries. Indus. and Engin. Chem. 20: 202–204, illus. (Abstract in Expt. Sta. Rec. 59: 94.)

Sugar. *See* Beans, Kidney.

Sweetbreads. *See* Beans, Kidney.

Sweet Potatoes, Autoclaved. *See* Carrots, Autoclaved.

Sweet Potatoes, Raw.
(1) *See* Dasheens (1).
(2) *See* Apples.
(3) Jansen, B. C. P., and Donath, W. F.
1928. The amount of vitamin A in different varieties of batata. Meded. Dienst. Volksgezondh. Nederland. Indië 17: 120–125, illus. (Abstract in Expt. Sta. Rec. 59: 492.)

Taros. *See* Dasheens (2).

Toheroa, Canned.
(1) Malcolm, J.
1928. Food values of New Zealand fish. Part 9. tinned toheroa and toheroa soup. New Zeal. Inst. Trans. and Proc. 59: 85–90, illus. (Abstract in Expt. Sta. Rec. 60: 93.)

Tomato Concentrate.
(1) Kohman, E. F.
1928. Research findings on corrosion and vitamin destruction. Canning Age 9: 227–231, illus. (Abstract in Expt. Sta. Rec. 59: 94.)

Tomatoes, Canned and Raw.
(1) Sherman, H. C., and Munsell, H. E.
1925. The quantitative determination of vitamin A. Jour. Amer. Chem. Soc. 47: 1639–1646, illus. (Abstract in Expt. Sta. Rec. 54: 89.)
(2) *See* Apples.

Vitamin A occurrence—Continued

Tomatoes, Green; Air, Ethylene, and Vine Ripened.
(1) Morgan, A. F., and Smith, L. L. W.
1928. DEVELOPMENT OF VITAMIN A DURING RIPENING OF TOMATOES. Soc. Expt. Biol. and Med. Proc. 26: 44–47.
(2) House, M. C., Nelson, P. M., and Haber, E. S.
1929. THE VITAMIN A, B, AND C CONTENT OF ARTIFICIALLY VERSUS NATURALLY RIPENED TOMATOES. Jour. Biol. Chem. 81: 495–504, illus. (Abstract in Expt. Sta. Rec. 61: 494.)

Turnip Greens.
(1) *See* Collards.
(2) *See* Cantaloupes.

Turnips, White. *See* Apples.

Veal. *See* Beef Muscle (1).

Vegetable Oils, Hydrogenated. *See* Margarins.

Walnuts, English.
(1) Mignon, H. L.
1923. BIOLOGICAL FOOD TESTS. IV. THE PROTEIN AND THE VITAMIN A CONTENT OF THE ENGLISH WALNUT. Amer. Jour. Physiol. 66: 215–231, illus. (Abstract in Expt. Sta. Rec. 50: 462–463.)

Watercress.
(1) Coward, K. H., and Eggleton, P.
1928. THE CONTENT OF VITAMINS A AND C IN WATERCRESS. Lancet [London] 214 (5446): 97–98, illus.

Wheat Bran.
(1) Stammers, A. D.
1921. FEEDING EXPERIMENTS IN CONNECTION WITH VITAMINS A AND B: (I). THE VALUE OF STEAM-DISTILLED PALM-KERNEL OIL AS A CONTROL FAT. (II). WHEAT BRAN AS A SOURCE OF VITAMINS A AND B. Biochem. Jour. 15: [489]–493, illus. (Abstract in Expt. Sta. Rec. 46: 256.)

Wheat Flour, Patent and Whole.
(1) Sheehy, E. J.
1927. THE RELATIVE FOOD VALUES OF BROWN (FROM "ENTIRE" WHEAT GRAIN) AND WHITE (FROM ENDOSPERM OF GRAIN) WHEATEN FLOUR, AND THEIR COMPARATIVE POTENCY FOR THE PREVENTION OF XEROPHTHALMIA IN GUINEA-PIGS. Roy. Irish Acad. Proc. 37, Sect. B (27): 415–425. (Abstract in Expt. Sta. Rec. 60: 393–394.)

Wheat Germ.
(1) McCollum, E. V., Simmonds, N., and Pitz, W.
1916. THE NATURE OF THE DIETARY DEFICIENCIES OF THE WHEAT EMBRYO. Jour. Biol. Chem. 25: 105–131, illus. (Abstract in Expt. Sta. Rec. 35: 265–266.)
(2) *See* Rye, Germ.

Wheat, Whole. *See* Corn (Maize), White and Yellow (1).

Yautia, White and Yellow. *See* Plantains.

Yeast.
(1) Luce, E. M., and Maclean, I. S.
1925. THE PRESENCE OF VITAMIN A IN YEAST FAT. Biochem. Jour. 19: [47]–51, illus. (Abstract in Expt. Sta. Rec. 53: 502–504.)
(2) Hume, E. M., Smith, H. H., and Smedley-MacLean, I.
1928. THE EXAMINATION OF YEAST-FAT FOR THE PRESENCE OF VITAMINS A AND D BEFORE IRRADIATION AND OF VITAMIN D AFTER IRRADIATION. Biochem. Jour. 22 27–33, illus. (Abstract in Expt. Sta. Rec. 59: 595.)

LITERATURE REFERENCES ON THE OCCURRENCE OF VITAMIN B[3]

Adlay.
(1) Santos, F. O., and Collado, E. G.
1925. THE NUTRITIVE VALUE OF PHILIPPINE CEREALS. I. THE VITAMIN B CONTENT OF GLUTINOUS RICE, DEAD RICE, AND ADLAY. Philippine Agr. 14: 473–477, illus. (Abstract in Expt. Sta. Rec. 55: 294.)

[3] These references include only those to studies in which rats or mice were used as the experimental animals.

Vitamin B occurrence—Continued

Almonds.
(1) Cajori, F. A.
1920. some nutritive properties of nuts; their proteins and content of water-soluble vitamine. Jour. Biol. Chem. 43: 583–606, illus. (Abstract in Expt. Sta. Rec. 44: 461.)

Apples.
(1) Osborne, T. B., and Mendel, L. B.
1920. the occurrence of water-soluble vitamine in some common fruits. Jour. Biol. Chem. 42: 465–489, illus. (Abstract in Expt. Sta. Rec. 43: 765.)
(2) Sherman, H. C.
1926. chemistry of food and nutrition. Ed. 3, rewritten and enl., 636 p., illus. New York. (Results of quantitative experiments upon vitamin B contents of foods, p. 408.)

Artichokes, Globe.
(1) Santos, F. O.
1922. some plant sources of vitamins b and c. Amer. Jour. Physiol. 59: 310–334, illus. (Abstract in Expt. Sta. Rec. 47: 465.)
(2) Morgan, A. F., and Stephenson, H. D.
1923. biological food tests. iii. changes in vitamins a and b of the globe artichoke due to various canning and drying processes. Amer. Jour. Physiol. 65: 491–502, illus. (Abstract in Expt. Sta. Rec. 50: 462.)

Asparagus.
(1) Osborne, T. B., and Mendel, L. B.
1922. further observations on the distribution of vitamin b in some vegetable foods. Jour. Amer. Med. Assoc. 78: 1121–1122, illus. (Abstract in Expt. Sta. Rec. 47: 267–268.)

Avocados.
(1) Weatherby, L. S., and Waterman, E. W.
1928. vitamin b content of avocados. Indus. and Engin. Chem. 20: 968–970, illus. (Abstract in Expt. Sta. Rec. 61: 293.)

Bacon.
(1) Sherman, H. C.
1926. chemistry of food and nutrition. Ed. 3, rewritten and enl., 636 p., illus. New York. (Foods as sources of vitamins A, B, and C, p. 598–603.)

Bamboo Shoots. *See* Artichokes, Globe (1).

Bananas.
(1) Acuña, E. M.
1923. the vitamin b content of some philippine fruits and vegetables. Philippine Agr. 12: 293–302, illus. (Abstract in Expt. Sta. Rec. 51: 666–667.)
(2) *See* Apples (2).
(3) Eddy, W. H., and Kellogg, M.
1927. the place of the banana in the diet. Amer. Jour. Pub. Health 17: 27–35, illus. (Abstract in Expt. Sta. Rec. 56: 894.)

Barley.
(1) Harden, A., and Zilva, S. S.
1924. investigation of barley, malt and beer for vitamins b and c. Biochem. Jour. 18: [1129]–1132. (Abstract in Expt. Sta. Rec. 52: 564.)
(2) Southgate, H. W.
1924. the dietetic value of barley, malt and malted liquors as determined by their vitamin content. Biochem. Jour. 18: [769]–776, illus. (Abstract in Expt. Sta. Rec. 52: 365.)

Beans, Kidney. *See* Bacon.

Beans, Mung. *See* Artichokes, Globe (1).

Beans, Mung, Sprouted, Cooked and Raw.
(1) Miller, C. D., and Hair, D. B.
1928. the vitamin content of mung bean sprouts. Jour. Home Econ. 20: 263–271. (Abstract in Expt. Sta. Rec. 59: 192.)

Beans, Navy, Canned Baked. *See* Apples (2).

Vitamin B occurrence—Continued

Beans, Navy, Cooked.
(1) Daniels, A. L., and McClurg, N. I.
1919. influence of high temperatures and dilute alkalies on the antineuritic properties of foods. Jour. Biol. Chem. 37: 201–213, illus. (Abstract in Expt. Sta. Rec. 40: 565.)

Beans, Navy, Dried, Raw.
(1) McCollum, E. V., Simmonds, N., and Pitz, W.
1917. the dietary deficiencies of the white bean, phaseolus vulgaris. Jour. Biol. Chem. 29: 521–536, illus. (Abstract in Expt. Sta. Rec. 37: 163–164.)

Beans, String, Canned.
(1) Fong, W. Y.
1927. vitamin b in canned string beans. Amer. Food Jour. 22: 197–198, illus.

Beans, String, Cooked.
(1) Russell, H. L., Morrison, F. B., and Ebling, W. H.
1926. losses of vitamin b in vegetables in cookery. Wis. Agr. Expt. Sta. Bul. 388: 125–126. (Abstract in Expt. Sta. Rec. 56: 794.)

Beans, String, Raw.
(1) *See* Apples (2).
(2) Quinn, E. J., Burtis, M. P., and Milner, E. W.
1927. quantitative studies of vitamins a, b, and c in green plant tissues other than leaves. Jour. Biol. Chem. 72: 557–563. (Abstract in Expt. Sta. Rec. 57: 293.)

Beechnuts. *See* Bacon.

Beef Fat. *See* Bacon.

Beef Juice. *See* Bacon.

Beef Muscle.
(1) Osborne, T. B., and Mendel, L. B.
1917. nutritive factors in animal tissues. i. Jour. Biol. Chem. 32: 309–323, illus. (Abstract in Expt. Sta. Rec. 39: 665.)
(2) *See* Apples (2).
(3) Hoagland, R.
1929. antineuritic and water-soluble b vitamins in beef and pork. Jour. Agr. Research [U. S.] 38: 431–446, illus. (Abstract in Expt. Sta. Rec. 60: 390–391.)

Beets, Leaves and Stems.
(1) Osborne, T. B., and Mendel, L. B.
1919. nutritive factors in plant tissues. ii. the distribution of water-soluble vitamine. Jour. Biol. Chem. 39: 29–34, illus. (Abstract in Expt. Sta. Rec. 41: 762.)

Beets, Root.
(1) Osborne, T. B., and Mendel, L. B.
1920. nutritive factors in plant tissues. iii. further observation on the distribution of water-soluble vitamine. Jour. Biol. Chem. 41: 451–468, illus. (Abstract in Expt. Sta. Rec. 42: 759–760.)
(2) Scheunert, A.
1927. über den vitamingehalt der für die fütterung wichtigen rübenarten. Zuchtungskunde 2: 264–278, illus.

Brains.
(1) Osborne, T. B., and Mendel, L. B.
1918. nutritive factors in animal tissues. ii. Jour. Biol. Chem. 34: 17–27, illus. (Abstract in Expt. Sta. Rec. 39: 873.)

Brazil Nuts. *See* Almonds.

Bread, Rye.
(1) Hara, S.
1924. über den vitamingehalt des brotes. Biochem. Ztschr. 144: [52]–59, illus. (Abstract in Expt. Sta. Rec. 51: 368.)

Bread, White, Milk.
(1) Eddy, W. H.
1924. the place in the diet of white bread made with milk. Jour. Home Econ. 16: 428–438, illus.

Vitamin B occurrence—Continued

Bread, White, Water.
(1) HARTWELL, G. A.
1924. VITAMIN B CONTENT OF WHITE BREAD. Biochem. Jour. 18: [120]–126, illus. (Abstract in Expt. Sta. Rec. 51: 567.)
(2) CRAMER, W., and MOTTRAM, J. C.
1927. ON THE NUTRITIVE VALUE OF BREAD, WITH SPECIAL REFERENCE TO ITS CONTENT IN VITAMIN B. Lancet [London] 213: 1090–1095, illus.

Bread, Whole-Wheat.
(1) *See* Bacon.
(2) *See* Bread, White, Water (2).

Butter. *See* Bacon.

Butternuts. *See* Bacon.

Cabbage, Cooked and Raw.
(1) *See* Beets, Root (1).
(2) DUNHAM, G. C.
1921. THE WATER SOLUBLE B VITAMINE CONTENT OF CERTAIN VEGETABLES. Mil. Surg. 48: 223–234, illus. (Abstract in Expt. Sta. Rec. 45: 765.)

Cantaloupes.
(1) *See* Apples (2).
(2) NEWTON, C. L.
1928. VITAMIN CONTENT OF CANTALOUPES, TURNIP GREENS, AND COLLARDS — PRELIMINARY REPORT. (Abstract) Jour. Home Econ. 20: 760–761.

Carrots, Cooked and Raw.
(1) *See* Beets, Root (1).
(2) *See* Cabbage, Cooked and Raw (2).
(3) *See* Apples (2).

Cauliflower, Cooked and Raw.
(1) RUSSELL, H. L., MORRISON, F. B., and EBLING, W. H.
1926. LOSSES OF VITAMIN B IN VEGETABLES IN COOKERY. Wis. Agr. Expt. Sta. Bul. 388: 125–126. (Abstract in Expt. Sta. Rec. 57: 794.)

Celery Stalks. *See* Asparagus.

Celery Stalks, Ethylene Bleached.
(1) BABB, M. F.
1928. THE EFFECT OF ETHYLENE UPON THE VITAMIN B CONTENT OF CELERY. Science (N. S.) 68: 231.

Chard, Swiss. *See* Bacon.

Cheese, American. *See* Bacon.

Cherries, Canned.
(1) KANSAS AGRICULTURAL EXPERIMENT STATION.
1928. THE VITAMIN CONTENT OF SOME COMMON FRUITS AND VEGETABLES. Kans. Agr. Expt. Sta. Rpt. 1926–1928: 123–124.

Chestnuts. *See* Almonds.

Clams.
(1) JONES, D. B., NELSON, E. M., and MURPHY, J. C.
1928. BIOLOGICAL VALUES OF CERTAIN TYPES OF SEA FOODS. III. VITAMINS IN CLAMS. Indus. and Engin. Chem. 20: 648–652, illus. (Abstract in Expt. Sta. Rec. 59: 688.)

Coconut. *See* Bacon.

Coconut Oil. *See* Bacon.

Coconut Press Cake.
(1) JOHNS, C. O., FINKS, A. J., and PAUL, M. S.
1919. STUDIES IN NUTRITION. I. THE NUTRITIVE VALUE OF COCONUT GLOBULIN AND COCONUT PRESS CAKE. Jour. Biol. Chem. 37: 497–502, illus. (Abstract in Expt. Sta. Rec. 41: 262–263.)

Cod-liver Oil. *See* Bacon.

Collards, Cooked and Raw.
(1) GEORGIA AGRICULTURAL EXPERIMENT STATION.
1927. [VITAMIN CONTENT OF GEORGIA GROWN FOODS.] Ga. Agr. Expt. Sta. Ann. Rpt. 40: 28. (Abstract in Expt. Sta. Rec. 59: 293.)
(2) BURTON, G. W.
1928. QUANTITATIVE DETERMINATION OF VITAMINS A, B AND C IN COLLARDS AND TURNIP GREENS. Jour. Home Econ. 20: 35–42. (Abstract in Expt. Sta. Rec. 59: 191–192.)

Vitamin B occurrence—Continued

Corn (Maize) and Mill Products.
(1) Croll, H. M., and Mendel, L. B.
1925. THE DISTRIBUTION OF VITAMIN B IN THE MAIZE KERNEL. Amer. Jour. Physiol. 74: 674–694, illus. (Abstract in Expt. Sta. Rec. 54: 793–794.)
(2) Illinois Agricultural Experiment Station.
1927. [THE DISTRIBUTION OF VITAMIN B IN THE RICE KERNEL AND IN CORN PRODUCTS.] Ill. Agr. Expt. Sta. Ann. Rpt. 40: 263–264. (Abstract in Expt. Sta. Rec. 58: 390–391.)
(3) Rocke, C., Plant, M., and Hetler, R. A.
1928. STUDIES OF WHOLE CORN AND HOMINY FEED AS SOURCES OF VITAMIN B FOR GROWTH, REPRODUCTION, AND LACTATION. (Abstract) Jour. Home Econ. 20: 759–760.
Corn (Maize) Oil. *See* Bacon.
Cottonseed Oil. *See* Bacon.
Cowpeas, Cooked. *See* Bananas (1).
Cream. *See* Bacon.
Cucumbers. *See* Bacon.
Dandelion Greens. *See* Asparagus.
Dasheens.
(1) Steenbock, H., and Gross, E. G.
1919. FAT-SOLUBLE VITAMINE. II. THE FAT-SOLUBLE VITAMINE CONTENT OF ROOTS, TOGETHER WITH SOME OBSERVATIONS ON THEIR WATER-SOLUBLE VITAMINE CONTENT. Jour. Biol. Chem. 40: 501–532, illus. (Abstract in Expt. Sta. Rec. 42: 460–461.)
(2) *See* Limu.
Dates.
(1) Smith, M. C.
1928. THE VITAMIN CONTENT OF THE ARIZONA DATE — PRELIMINARY REPORT. (Abstract) Jour. Home Econ. 20: 760.
Eggplant. *See* Bacon.
Eggs, Duck.
(1) Tso, E.
1926. THE EFFECT OF CHEMICAL PRESERVATION OF EGGS UPON THE STABILITY OF THEIR VITAMIN CONTENTS. Biochem. Jour. 20: [17]–22, illus. (Abstract in Expt. Sta. Rec. 55: 594.)
Eggs, Hen, Whole. *See* Apples (2).
Eggs, Hen, Yolk.
(1) Osborne, T. B., and Mendel, L. B.
1923. EGGS AS A SOURCE OF VITAMIN B. Jour. Amer. Med. Assoc. 80: 302–303. (Abstract in Expt. Sta. Rec. 49: 161.)
(2) *See* Apples (2).
Filberts. *See* Almonds.
Fish.
(1) Drummond, J. C.
1918. THE NUTRITIVE VALUE OF CERTAIN FISH. Jour. Physiol. 52: [95]–109, illus. (Abstract in Expt. Sta. Rec. 40: 66.)
Glucose. *See* Bacon.
Grapefruit Juice, Dried and Fresh. *See* Apples (1).
Grapefruit Peel.
(1) Willimott, S. G., and Wokes, F.
1926. VITAMINS AND OTHER CONSTITUENTS OF GRAPE-FRUIT RIND. Biochem. Jour. 20: [1299]–1305, illus. (Abstract in Expt. Sta. Rec. 56: 409–410.)
Grape Juice. *See* Apples (1).
Grapes. *See* Apples (2).
Ham, Fresh and Smoked. *See* Beef Muscle (3).
Heart Muscle. *See* Brains.
Hickory Nuts. *See* Almonds.
Honey.
(1) Kifer, H. B., and Munsell, H. E.
1929. VITAMIN CONTENT OF HONEY AND HONEYCOMB. Jour. Agr. Research [U. S.] 39: 355–366, illus.
Horse Fat. *See* Bacon.

Vitamin B occurrence—Continued

Kaoliang, Red and White.
(1) EMBREY, H.
1921. THE INVESTIGATION OF SOME CHINESE FOODS. PAPER 2. FEEDING EXPERIMENTS ON WHITE MICE USING MUNG BEANS, MUNG BEAN SPROUTS, RED KAOLIANG, WHITE KAOLIANG, AND CHINESE PERSIMMONS. China Med. Jour. 35: 420–447, illus.

Kidney. *See* Brains.
Lamb. *See* Bacon.
Lard. *See* Bacon.
Lemon Juice. *See* Apples (1) and (2).
Lemon Peel.
(1) WILLIMOTT, S. G.
1926. THE VITAMIN B OF LEMON RIND. Biochem. Jour. 20: [31]–36, illus. (Abstract in Expt. Sta. Rec. 55: 593–594.)

Lentils.
(1) JONES, D. B., and MURPHY, J. C.
1924. CYSTINE DEFICIENCY AND VITAMIN CONTENT OF THE LENTIL, LENS ESCULENTA MOENCH. Jour. Biol. Chem. 59: 243–253, illus. (Abstract in Expt. Sta. Rec. 51: 665–666.)

Lettuce.
(1) *See* Asparagus.
(2) *See* Apples (2).

Limu.
(1) MILLER, C. D.
1927. FOOD VALUES OF POI, TARO, AND LIMU. Bernice P. Bishop Mus. Bul. 37, 25 p., illus. (Abstract in Expt. Sta. Rec. 58: 83–84.)

Litchi Nuts.
(1) SMITH, A. H., and SAH, P. P. T.
1927. VITAMINS A AND B IN THE CHINESE LITCHI NUT. Soc. Expt. Biol. and Med. Proc. 25: 63–64. (Abstract in Expt. Sta. Rec. 58: 691.)

Liver, Pig.
(1) OSBORNE, T. B., and MENDEL, L. B.
1923. THE EFFECT OF DIET ON THE CONTENT OF VITAMINE B IN THE LIVER. Jour. Biol. Chem. 58: 363–367, illus. (Abstract in Expt. Sta. Rec. 51: 268.)

Mabolo (Philippine Persimmon).
(1) JESUS, F. DE.
1927. THE VITAMIN B CONTENT OF SOME PHILIPPINE FRUITS AND VEGETABLES. III. Philippine Agr. 15: 533–546, illus. (Abstract in Expt. Sta. Rec. 57: 94.)

Malt. *See* Barley (1) and (2).
Malt Extract.
(1) RANDOIN, L., and LECOQ, R.
1927. LE MALT ET L'EXTRAIT DE MALT ENVISAGÉS COMME SOURCES DE VITAMINES HYDROSOLUBLES B ET C. Bul. Soc. Chim. Biol. 9: [49]–58, illus. (Abstract in Expt. Sta. Rec. 56: 894–895.)

Margarins. *See* Bacon.
Meat Extract. *See* Beef Muscle (1).
Milk, Cow's, Skim, Dried.
(1) JOHNSON, J. M.
1921. THE GROWTH-PROMOTING PROPERTIES OF MILK AND DRIED MILK PREPARATIONS. Pub. Health Rpts. [U. S.] 36: 2044–2057, illus. (Abstract in Expt. Sta. Rec. 46: 60.)
(2) SHERMAN, H. C., and SPOHN, A.
1923. A CRITICAL INVESTIGATION AND AN APPLICATION OF THE RAT-GROWTH METHOD FOR THE STUDY OF VITAMIN B. Jour. Amer. Chem. Soc. 45: 2719–2728, illus. (Abstract in Expt. Sta. Rec. 51: 368–369.)

Milk, Cow's, Skim, Raw. *See* Bacon.
Milk, Cow's, Whole, Dried.
(1) *See* Milk, Cow's, Skim, Dried (1) and (2).
(2) *See* Apples (2).

Vitamin B occurrence—Continued

Milk, Cow's, Whole, Evaporated.
(1) DUTCHER, R. A., and FRANCIS, E.
1926. VITAMIN STUDIES. XIII. VITAMIN B IN EVAPORATED MILKS MADE BY VACUUM AND AERATION PROCESSES. Jour. Dairy Sci. 9: 379–387, illus. (Abstract in Expt. Sta. Rec. 56: 190.)
(2) SHERMAN, H. C., and MACARTHUR, E. H.
1927. A QUANTITATIVE STUDY OF THE DETERMINATION OF VITAMIN B. Jour. Biol. Chem. 74: 107–115, illus. (Abstract in Expt. Sta. Rec. 57: 895.)

Milk, Cow's, Whole, Pasteurized. *See* Milk, Cow's, Skim, Dried (1)

Milk, Cow's, Whole, Raw.
(1) *See* Apples (2).
(2) OUTHOUSE, J., MACY, I. G., BREKKE, V., and GRAHAM, A.
1927. HUMAN MILK STUDIES. IV. A NOTE ON THE VITAMIN A AND B CONTENT OF COW'S MILK. Jour. Biol. Chem. 73: 203–208, illus. (Abstract in Expt. Sta. Rec. 57: 390–391.)

Milk, Cow's, Whole, Scalded. *See* Bacon.

Milk, Human, Dried.
(1) OSBORNE, T. B., and MENDEL, L. B.
1922. MILK AS A SOURCE OF WATER-SOLUBLE VITAMIN. III. Biochem. Jour. 16: [363]–367, illus. (Abstract in Expt. Sta. Rec. 47: 861.)

Milk, Human, Raw.
(1) MACY, I. G., OUTHOUSE, J., GRAHAM, A., and LONG, M. L.
1927. HUMAN MILK STUDIES. III. THE QUANTITATIVE ESTIMATION OF VITAMIN B. Jour. Biol. Chem. 73: 189–201, illus. (Abstract in Expt. Sta. Rec. 57: 390.)

Millet.
(1) MCCOLLUM, E. V.
1917. THE SUPPLEMENTARY DIETARY RELATIONSHIPS AMONG OUR NATURAL FOODSTUFFS. Jour. Amer. Med. Assoc. 68: [1379]–1386, illus.

Molasses.
(1) NELSON, V. E., HELLER, V. G., and FULMER, E. I.
1925. MOLASSES AS A SOURCE OF VITAMIN B. Indus. and Engin. Chem. 17: 199–201, illus. (Abstract in Expt. Sta. Rec. 53: 660–661.)

Mushrooms, Dried.
(1) ORTON, C. R., MCCOLLUM, E. V., and SIMMONDS, N.
1922. OBSERVATIONS ON THE PRESENCE OF THE ANTINEURITIC SUBSTANCE, WATER-SOLUBLE B, IN CHLOROPHYLL-FREE PLANTS. Jour. Biol. Chem. 53: 1–6, illus. (Abstract in Expt. Sta. Rec. 48: 162.)

Mutton. *See* Bacon.

Mutton Fat. *See* Bacon.

Oatmeal. *See* Bacon.

Oats.
(1) MCCOLLUM, E. V., SIMMONDS, N., and PITZ, W.
1917. THE NATURE OF THE DIETARY DEFICIENCIES OF THE OAT KERNEL. Jour. Biol. Chem. 29: 341–354, illus. (Abstract in Expt. Sta. Rec. 37: 61.)
(2) ROCKE, C., and HETLER, R. A.
1928. THE CONTENT AND DISTRIBUTION OF VITAMIN B IN THE OAT KERNEL. (Abstract) Jour. Home Econ. 20: 762.

Okra. *See* Artichokes, Globe (1).

Oleo Oil. *See* Bacon.

Olive Oil. *See* Bacon.

Onions.
(1) *See* Beets, Leaves and Stems.
(2) *See* Apples (2).

Orange Juice, Dried. *See* Apples (1).

Orange Juice, Fresh.
(1) *See* Apples (1) and (2).
(2) WILLIMOTT, S. G.
1928. THE VITAMINS OF ORANGE JUICE. Biochem. Jour. 22: [67]–76, illus. (Abstract in Expt. Sta. Rec. 59: 94.)

Vitamin B occurrence—Continued

Orange Peel, Inner. *See* Apples (1).
Orange Peel, Outer.
(1) WILLIMOTT, S. G., and WOKES, F.
1927. SOME CONSTITUENTS OF CITRUS FRUITS. Pharm. Jour. and Pharm. [London] (ser. 4, v. 64) 118: 770–773, illus. (Abstract in Expt. Sta. Rec. 59: 93.)
Oysters.
(1) JONES, D. B., MURPHY, J. C., and NELSON, E. M.
1928. BIOLOGICAL VALUES OF CERTAIN TYPES OF SEA FOOD. II. VITAMINS IN OYSTERS (OSTREA VIRGINICA). Indus. and Engin. Chem. 20: 205–210, illus. (Abstract in Expt. Sta. Rec. 59: 95.)
Papayas.
(1) *See* BLananas (1).
(2) MILER, C. D.
1926. THE VITAMINS (A, B, AND C) OF PAPAYA. Biochem. Jour. 20: [515]–518. (Abstract in Expt. Sta. Rec. 56: 87.)
Parsley. *See* Asparagus.
Parsnips. *See* Bacon.
Peaches, Canned. *See* Cherries, Canned.
Peaches, Raw. *See* Cantaloupes (1) and (2).
Peanut Oil. *See* Bacon.
Peanuts.
(1) DANIELS, A. L., and LOUGHLIN, R.
1918. FEEDING EXPERIMENTS WITH PEANUTS. Jour. Biol. Chem. 33: 295–301, illus. (Abstract in Expt. Sta. Rec. 39: 471.)
(2) JOHNS, C. O., and FINKS, A. J.
1920. STUDIES IN NUTRITION. IV. THE NUTRITIVE VALUE OF PEANUT FLOUR AS A SUPPLEMENT TO WHEAT FLOUR. Jour. Biol. Chem. 42: 569–579, illus. (Abstract in Expt. Sta. Rec. 43: 763–764.)
Pears, Raw.
(1) *See* Apples (1).
(2) *See* Cherries, Canned.
Peas, Dried.
(1) MCCOLLUM, E. V., SIMMONDS, N., and PARSONS, H. T.
1919. THE DIETARY PROPERTIES OF THE PEA (VICIA SATIVA). Jour. Biol. Chem. 37: 287–301, illus. (Abstract in Expt. Sta. Rec. 40: 762.)
Peas, Garbanza (Chick or Idaho).
(1) MITCHELL, H. S.
1928. NUTRITIVE VALUE OF THE GARBANZA PEA. West. Hosp. and Nurses Rev. 11(6): 26–27, 52–53, illus. (Abstract in Expt. Sta. Rec. 59: 792.)
Peas, Green, Canned, Cooked, and Raw.
(1) EDDY, W. H., KOHMAN, E. F., and CARLSSON, V.
1926. VITAMINS IN CANNED FOODS. IV. GREEN PEAS. Indus. and Engin. Chem. 18: 85–89, illus. (Abstract in Expt. Sta. Rec. 55: 793–794.)
(2) DYE, M., and HERSHEY, R.
1928. THE EFFECT OF CANNING ON THE VITAMIN A AND B CONTENT OF PEAS—PRELIMINARY REPORT. (Abstract) Jour. Home Econ. 20: 761–762.
Peas, Green, Raw. *See* Apples (2).
Pecans.
(1) SALMON, W. D., and LIVINGSTON, C. W.
1925. VITAMINS A AND B IN THE PECAN NUT. Jour. Home Econ. 17: 129–135, illus. (Abstract in Expt. Sta. Rec. 54: 90.)
Peppers, Green. *See* Beans, String, Raw (2).
Pig Kidney Fat. *See* Bacon.
Pineapples, Canned and Raw.
(1) MILLER, C. D.
1924. VITAMINS A AND B IN FRESH AND CANNED PINEAPPLE. Jour. Home Econ. 16: 18–26, illus. (Abstract in Expt. Sta. Rec. 51: 167.)
Pine Nuts. *See* Bacon.

Vitamin B occurrence—Continued

Plantains (Baking Bananas).
(1) Cook, D. H.
1927. VITAMIN STUDIES IN PORTO RICO. Porto Rico Health Rev. 2(11): 22–23. (Abstract in Expt. Sta. Rec. 57: 690.)

Poi. *See* Limu.

Pork. *See* Beef Muscle (3).

Potatoes.
(1) *See* Dasheens (1).
(2) *See* Beets, Root (1).
(3) Lyman, F. J., and Blystone, I.
1926. THE WHITE POTATO AS A SOURCE OF VITAMIN B. Jour. Home Econ. 18: 199–204, illus. (Abstract in Expt. Sta. Rec. 56: 89–90.)
(4) *See* Apples (2).

Prunes, Dried. *See* Apples (2).

Prunes, Fresh. *See* Apples (1).

Pumpkin, Dried and Raw.
(1) Morgan, A. F., and Francis, L. D.
1924. BIOLOGICAL FOOD TESTS. VII. THE VITAMINS A AND B CONTENT OF FRESH AND DEHYDRATED PUMPKIN. Amer. Jour. Physiol. 69: 67–77, illus. (Abstract in Expt. Sta. Rec. 52: 762.)

Radishes.
(1) Morgan, A. F.
1924. BIOLOGICAL FOOD TESTS. VIII. VITAMINS A AND B IN RADISH. Amer. Jour. Physiol. 69: 634–637, illus. (Abstract in Expt. Sta. Rec. 53: 62.)

Raisins.
(1) Dutcher, R. A., and Outhouse, J.
1923. THE VITAMIN CONTENT OF RAISINS AND RAISIN BY-PRODUCTS. Penn. Agr. Expt. Sta. Bul. 181: 18. (Abstract in Expt. Sta. Rec. 50: 463.)

Rice.
(1) McCollum, E. V., and Davis, M.
1915. THE NATURE OF THE DIETARY DEFICIENCIES OF RICE. Jour. Biol. Chem. 23: 181–230, illus. (Abstract in Expt. Sta. Rec. 34: 367–368.)
(2) *See* Corn (Maize) and Mill Products (2).

Rice Polishings.
(1) Munsell, H. E.
1929. RICE POLISHINGS AS A SOURCE OF VITAMIN B. A PRELIMINARY REPORT. Jour. Home Econ. 21: 124–129, illus.

Rice Polishings, Extract (Tiki-tiki).
(1) Santos, F. O., and Collado, E. G.
1925. VITAMIN B IN TIKITIKI EXTRACT PREPARED BY THE PHILIPPINE BUREAU OF SCIENCE. Philippine Agr. 14: 243–245, illus. (Abstract in Expt. Sta. Rec. 54: 90.)

Rice, Wild.
(1) Kennedy, C.
1924. THE NUTRITIVE PROPERTIES OF WILD RICE (ZIZANIA AQUATICA). Jour. Agr. Research [U. S.] 27: 219–224, illus. (Abstract in Expt. Sta. Rec. 51: 163.)

Roe, Fish. *See* Bacon.

Romaine. *See* Bacon.

Rutabagas.
(1) *See* Dasheens (1).
(2) *See* Beets, Root (2).

Rye Germ.
(1) Scheunert, A.
1927. ÜBER DEN GEHALT VON WEIZEN-UND ROGGENKEIMEN AN VITAMINEN. Biochem. Ztschr. 183: [113]–121, illus. (Abstract in Expt. Sta. Rec. 58: 87.)

Rye, Whole.
(1) Guest, A. E., Nelson, V. E., Parks, T. B., and Fulmer, E. I.
1926. DIET IN RELATION TO REPRODUCTION AND REARING OF YOUNG. II. Amer. Jour. Physiol. 76: 339–348. (Abstract in Expt. Sta. Rec. 56: 65–66.)

Vitamin B occurrence—Continued

Santol. *See* Mabolo (Philippine Persimmon).
Sauerkraut. *See* Bacon.
Soybeans.
(1) Osborne, T. B., and Mendel, L. B.
1917. THE USE OF SOY BEAN AS FOOD. Jour. Biol. Chem. 32: 369–387, illus. (Abstract in Expt. Sta. Rec. 39: 667.)
Spinach, Canned, Cooked, and Raw.
(1) Eddy, W. H., Kohman, E. F., and Carlsson, V.
1925. VITAMINS IN CANNED FOODS. III. CANNED SPINACH. Indus. and Engin. Chem. 17: 69–74, illus. (Abstract in Expt. Sta. Rec. 53: 764–765.)
Spinach, Raw.
(1) *See* Beets, Root (1).
(2) *See* Apples (2).
Strawberries, Canned and Raw.
(1) Kohman, E. F., Eddy, W. H., and Halliday, N.
1928. VITAMINS IN CANNED FOODS. VI. STRAWBERRIES. Indus. and Engin. Chem. 20: 202–204, illus. (Abstract in Expt. Sta. Rec. 59: 94.)
Sugar. *See* Bacon.
Sweetbreads. *See* Bacon.
Sweet Potatoes. *See* Bacon.
Sweet Potatoes, Leaves and Shoots. *See* Artichokes, Globe.
Taros. *See* Limu.
Togi (Beans, Mung, Sprouted). *See* Artichokes, Globe (1).
Tomato Concentrate.
(1) Kohman, E. F.
1928. RESEARCH FINDINGS ON CORROSION AND VITAMIN DESTRUCTION. Canning Age 9: 227–231, illus. (Abstract in Expt. Sta. Rec. 59: 94.)
Tomatoes, Green; Air, and Vine Ripened.
(1) House, M. C., Nelson, P. M., and Haber, E. S.
1929. THE VITAMIN A, B, AND C CONTENT OF ARTIFICIALLY VERSUS NATURALLY RIPENED TOMATOES. Jour. Biol. Chem. 81: 495–504, illus. (Abstract in Expt. Sta. Rec. 61: 494.
Tomatoes, Ripe.
(1) *See* Beets, Root (1).
(2) Sherman, H. C., and Grose, M. R.
1923. A QUANTITATIVE STUDY OF THE DESTRUCTION OF VITAMIN B BY HEAT. Jour. Amer. Chem. Soc. 45: 2728–2738, illus. (Abstract in Expt. Sta. Rec. 51: 461–462.)
(3) *See* Apples (2).
Turnip Greens.
(1) *See* Collards (2).
(2) *See* Cantaloupes (2).
Turnips, White. *See* Beets, Root (2).
Veal. *See* Bacon.
Walnuts, English. *See* Almonds.
Wheat and Mill Products.
(1) Bell, M., and Mendel, L. B.
1922. THE DISTRIBUTION OF VITAMIN B IN THE WHEAT KERNEL. Amer. Jour. Physiol. 62: 145–161, illus. (Abstract in Expt. Sta. Rec. 47: 860.)
Wheat Germ Extract.
(1) Hoffman, C.
1925. PRODUCTION AND NUTRITIONAL VALUE OF COMMERCIAL WHEAT GERM EXTRACT. Indus. and Engin. Chem. 17: 498–503, illus. (Abstract in Expt. Sta. Rec. 53: 865.)
Yautia, White and Yellow. *See* Plantains.
Yeast, Baker's and Brewer's.
(1) *See* Soybeans.
(2) Kennedy, C., and Palmer, L. S.
1922. YEAST AS A SOURCE OF VITAMINE B FOR THE GROWTH OF RATS. Jour. Biol. Chem. 54: 217–232, illus. (Abstract in Expt. Sta. Rec. 48: 759–760.)
Yeast, Brewer's, Dried. *See* Rice Polishings.

LITERATURE REFERENCES ON THE RELATIVE DISTRIBUTION OF VITAMINS F (B_1) AND G (B_2)

Bananas.

(1) EDDY, W. H.
1927. VITAMIN B TESTING REVISED. Soc. Expt. Biol. and Med. Proc. 25: 125–127. (Abstract in Expt. Sta. Rec. 58: 692.)

Beef, Dried, Fresh, and Lean.

(1) GOLDBERGER, J., WHEELER, G. A., LILLIE, R. D., and ROGERS, L. M.
1926. A FURTHER STUDY OF BUTTER, FRESH BEEF, AND YEAST AS PELLAGRA PREVENTIVES, WITH CONSIDERATION OF THE RELATION OF FACTOR P-P OF PELLAGRA (AND BLACK TONGUE OF DOGS) TO VITAMIN B. Pub. Health Rpts. [U. S.] 41: 297–318, illus. (Abstract in Expt. Sta. Rec. 55: 890–891.)

Corn (Maize).

(1) HUNT, C. H.
1928. THE COMPLEX NATURE OF VITAMIN B AS FOUND IN WHEAT AND CORN. XX. Jour. Biol. Chem. 78: 83–90, illus. (Abstract in Expt. Sta. Rec. 59: 689.)

Cornmeal. *See* Beef, Dried, Fresh, and Lean.

Milk, Cow's, Evaporated.

(1) DANIELS, A. L., and BROOKS, L.
1927. FURTHER EVIDENCE OF DESTRUCTION OF VITAMIN B IN EVAPORATED MILK. Soc. Expt. Biol. and Med. Proc. 25: 161–163. (Abstract in Expt. Sta. Rec. 58: 692–693.)

Milk, Cow's, Skim, Dried.

(1) SHERMAN, H. C., and AXTMAYER, J. H.
1927. A QUANTITATIVE STUDY OF THE PROBLEM OF THE MULTIPLE NATURE OF VITAMIN B. Jour. Biol. Chem. 75: 207–212, illus. (Abstract in Expt. Sta. Rec. 58: 295–296.)

Milk, Cow's, Whole, Raw.

(1) OUTHOUSE, J., MACY, I. G., BREKKE, V., and GRAHAM, A.
1927. HUMAN MILK STUDIES. IV. A NOTE ON THE VITAMIN A AND B CONTENT OF COW'S MILK. Jour. Biol. Chem. 73: 203–208, illus. (Abstract in Expt. Sta. Rec. 57: 390–391.)

(2) HUNT, C. H., and KRAUSS, W. E.
1928. THE RELATIVE ANTINEURITIC AND ANTIPELLAGRIC POTENCY OF COW'S MILK. Jour. Biol. Chem. 79: 733–738, illus. (Abstract in Expt. Sta. Rec. 60: 694–695.)

Milk, Human.

(1) MACY, I. G., OUTHOUSE, J., GRAHAM, A., and LONG, M. L.
1927. HUMAN MILK STUDIES. III. THE QUANTITATIVE ESTIMATION OF VITAMIN B. Jour. Biol. Chem. 73: 189–201, illus. (Abstract in Expt. Sta. Rec. 57: 390–391.)

Rice Polishings.

(1) MUNSELL, H. E.
1929. RICE POLISHINGS AS A SOURCE OF VITAMIN B. A PRELIMINARY REPORT. Jour. Home Econ. 21: 124–129, illus.

Rice Polishings, Extract (Tiki-Tiki).

(1) EVANS, H. M., and BURR, G. O.
1928. A NEW DIFFERENTIATION BETWEEN THE ANTINEURITIC VITAMIN B AND THE PURELY GROWTH-PROMOTING VITAMIN B. Jour. Biol. Chem. 77: 231–240, illus. (Abstract in Expt. Sta. Rec. 59: 594.)

Soybeans.

(1) SALMON, W. D.
1927. ON THE EXISTENCE OF TWO ACTIVE FACTORS IN THE VITAMIN B COMPLEX. Jour. Biol. Chem. 73: 483–497, illus. (Abstract in Expt. Sta. Rec. 57: 594–595.)

Spinach, Cooked. *See* Bananas.

Wheat Embryo.

(1) CHICK, H., and ROSCOE, M. H.
1927. ON THE COMPOSITE NATURE OF THE WATER-SOLUBLE B VITAMIN. Biochem. Jour. 21: [698]–711, illus. (Abstract in Expt. Sta. Rec. 57: 789–790.)

Wheat, Whole.

(1) *See* Milk, Cow's, Skim, Dried.
(2) *See* Corn (Maize).

Yeast, Brewer's, Autoclaved. *See* Beef, Dried, Fresh, and Lean.

Vitamin F (B_1) and Vitamin G (B_2) distribution—Continued

Yeast, Brewer's, Dried and Fresh.
(1) *See* Wheat Embryo.
(2) Hassan, A., and Drummond, J. C.
1927. THE PHYSIOLOGICAL RÔLE OF VITAMIN B. PART IV. THE RELATION OF CERTAIN DIETARY FACTORS IN YEAST TO GROWTH OF RATS ON DIETS RICH IN PROTEINS. Biochem. Jour. 21: [653]–661, illus. (Abstract in Expt. Sta. Rec. 58: 194–195.)
(3) *See* Milk, Cow's, Skim, Dried.
(4) *See* Rice Polishings.

Yeast, Distiller's.
(1) Randoin, L., and Lecoq, R.
1927. RECHERCHES EXPÉRIMENTALES SUR LA SENSIBILITÉ DES VITAMINES HYDROSOLUBLES B À LA DESSICCATION. Bul. Sci. Pharmacol. 34(3): [129]–138, illus. (Abstract in Expt. Sta. Rec. 57: 196.)

LITERATURE REFERENCES ON THE OCCURRENCE OF VITAMIN C

Apples, Canned and Cooked.
(1) Kohman, E. F., Eddy, W. H., and Carlsson, V.
1924. VITAMINS IN CANNED FOODS. II. THE VITAMIN C DESTRUCTIVE FACTOR IN APPLES. Indus. and Engin. Chem. 16: 1261–1263, illus. (Abstract in Expt. Sta. Rec. 53: 566–567.)

Apples, Dried.
(1) Givens, M. H., McClugage, H. B., and Van Horne, E. G.
1922. THE ANTISCORBUTIC PROPERTY OF FRUITS. II. AN EXPERIMENTAL STUDY OF APPLES AND BANANAS. Amer. Jour. Diseases Children 23: [210]–225, illus. (Abstract in Expt. Sta. Rec. 47: 268.)

Apples, Raw.
(1) Sherman, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., 636 p., illus. New York. (Tentative approximations of vitamin C contents of certain foods, p. 432.)

Bananas, Baked.
(1) Eddy, W. H., and Kellogg, M.
1927. THE PLACE OF THE BANANA IN THE DIET. Amer. Jour. Pub. Health 17: 27–35, illus. (Abstract in Expt. Sta. Rec. 56: 894.)

Bananas, Dried. *See* Apples Dried.

Bananas, Raw.
(1) Jansen, B. C. P., and Donath, W. F.
1925. ON THE QUANTITY OF ANTISCORBUTIC VITAMIN IN SOME CITRUS SPECIES AND IN BANANAS. Meded. Dienst Volksgezondh. Nederland. Indië 1925(3): [225]–239. (Abstract in Expt. Sta. Rec. 57: 690.)
(2) *See* Apples, Raw.

Barley.
(1) Cohen, B., and Mendel, L. B.
1918. EXPERIMENTAL SCURVY OF THE GUINEA PIG IN RELATION TO THE DIET. Jour. Biol. Chem. 35: 425–453. (Abstract in Expt. Sta. Rec. 39: 770–771.)

Beans, Kidney, Canned.
(1) Remy, E.
1928. ÜBER DAS VERHALTEN DES ANTISKORBUTISCHEN VITAMIN BEI DER STERILISATION. Ztschr. Untersuch. Lebensmtl. 55: 385–393, illus. (Abstract in Expt. Sta. Rec. 61: 295–296.)

Beans, Mung.
(1) Santos, F. O.
1922. SOME PLANT SOURCES OF VITAMINS B AND C. Amer. Jour. Physiol. 59: 310–334, illus. (Abstract in Expt. Sta. Rec. 47: 465.)

Beans, Mung, Sprouted.
(1) *See* Beans, Mung.
(2) Miller, C. D., and Hair, D. B.
1928 THE VITAMIN CONTENT OF MUNG BEAN SPROUTS. Jour. Home Econ. 20: 263–271. (Abstract in Expt. Sta. Rec. 59: 192.)

Vitamin C occurrence—Continued

Beans, Sprouted.
(1) SIMONIK, F.
1929. TENEUR EN VITAMINE C DES GRAINES DE LEGUMINEUSES PENDANT LA GERMINATION. Compt. Rend. Soc. Biol. [Paris] 100: 431–432. (Abstract in Expt. Sta. Rec. 61: 295.)

Beans, String, Canned.
(1) CAMPBELL, M. E. D., and CHICK, H.
1919. THE ANTISCORBUTIC AND GROWTH-PROMOTING VALUE OF CANNED VEGETABLES. Lancet [London] 197: 320–322. (Abstract in Expt. Sta. Rec. 42: 163.)

Beans, String, Raw.
(1) *See* Apples, Raw.
(2) QUINN, E. J., BURTIS, M. P., and MILNER, E. W.
1927. QUANTITATIVE STUDIES OF VITAMINS A, B, AND C, IN GREEN PLANT TISSUES OTHER THAN LEAVES. Jour. Biol. Chem. 72: 557—563. (Abstract in Expt. Sta. Rec. 57: 293.)

Beef Muscle, Raw.
(1) DUTCHER, R. A., PIERSON, E. M., and BIESTER, A.
1920. VITAMINE STUDIES. V. THE ANTISCORBUTIC PROPERTIES OF RAW BEEF. Jour. Biol. Chem. 42: 301–310. (Abstract in Expt. Sta. Rec. 43: 664.)
(2) MEDES, G.
1926. THE ANTISCORBUTIC VITAMINE IN FRESH BEEF. Jour. Lab. and Clin. Med. 11: 871–873.

Beets, Root.
(1) RUSSELL, H. L., and MORRISON, F. B.
1922. STABILITY OF THE ANTISCORBUTIC VITAMINE. Wis. Agr. Expt. Sta. Bul. 339: 123–124. (Abstract in Expt. Sta. Rec. 47: 464.)
(2) SCHEUNERT, A.
1927. ÜBER DEN VITAMINGEHALT DER FÜR DIE FÜTTERUNG WICHTIGEN RÜBENARTEN. Zuchtungskunde 2: 264–278, illus.

Bread.
(1) SHERMAN, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., 636 p., illus. New York. (Foods as sources of vitamins A, B, and C, p. 598–603.)

Butter. *See* Bread.

Buttermilk. *See* Bread.

Cabbage, Chinese.
(1) TSO, E.
1928. THE ANTISCORBUTIC VITAMIN IN CABBAGE SOUP, CABBAGE PUREE AND TURNIP JUICE. Chinese Jour. Physiol. 2: 403–407.

Cabbage, Dried.
(1) DELF, E. M., and SKELTON, R. F.
1918. THE ANTISCORBUTIC VALUE OF CABBAGE. II. THE EFFECT OF DRYING ON THE ANTISCORBUTIC AND GROWTH PROMOTING PROPERTIES OF CABBAGE. Biochem. Jour. 12: [448]–463, illus. (Abstract in Expt. Sta. Rec. 41: 168.)

Cabbage, Fresh and Stored, Canned, Cooked, Raw.
(1) DELF, E. M.
1918. THE ANTISCORBUTIC VALUE OF CABBAGE. I. THE ANTISCORBUTIC AND GROWTH-PROMOTING PROPERTIES OF RAW AND HEATED CABBAGE. Biochem. Jour. 12: [416]–445, illus. (Appendix by Tozer, F. M., On the histological diagnosis of experimental scurvy, p. 445–447, illus. Abstract in Expt. Sta. Rec. 41: 167–168.)
(2) EDDY, W. H., and KOHMAN, E. F.
1924. VITAMIN C IN CANNED FOODS. Indus. and Engin. Chem. 16: 52–53, illus. (Abstract in Expt. Sta. Rec. 51: 462.)

Cactus (Pricklypear).
(1) DELF, E. M.
1921. STUDIES IN EXPERIMENTAL SCURVY, WITH SPECIAL REFERENCE TO THE ANTISCORBUTIC PROPERTIES OF SOME SOUTH AFRICAN FOODSTUFFS. So. African Inst. Med. Research Pubs. No. 14, 105 p., illus. (Abridged in Lancet [London] 202: 576–579, 1922. Abstracts in Expt. Sta. Rec. 47: 568; 50: 64.)

Vitamin C occurrence—Continued

Cantaloupes.
(1) Georgia Agricultural Experiment Station.
1927. [vitamin content of georgia grown foods.] Ga. Agr. Expt. Sta. Ann. Rpt. 40: 28. (Abstract in Expt. Sta. Rec. 59: 293.)

Carrots.
(1) Hess, A. F., and Unger, L. J.
1919. the effect of heat, age, and reaction on the antiscorbutic potency of vegetables. Soc. Expt. Biol. and Med. Proc. 16: 52–53. (Abstract in Expt. Sta. Rec. 41: 266.)

Carrots, Canned. *See* Beans, Kidney, Canned.

Cauliflower.
(1) Holst, A., and Frölich, T.
1912. über experimentellen skorbut. ein beitrag zur lehre von dem einfluss einer einseitigen nahrung. Ztschr. Hyg. u. Infektionskrank. 72: 1–120, illus. (Abstract in Expt. Sta. Rec. 27: 567.)

Cauliflower, Canned. *See* Beans, Kidney, Canned.

Chicos (Sapodillas).
(1) Embrey, H.
1923. the antiscorbutic vitamine in some oriental fruits and vegetables. Philippine Jour. Sci. 22: 77–82, illus. (Abstract in Expt. Sta. Rec. 49: 563.)

Coconut Oil. *See* Bread.

Cod-liver Oil. *See* Bread.

Collards.
(1) Burton, G. W.
1928. quantitative determination of vitamins a, b, and c, in collards and turnip greens. Jour. Home Econ. 20: 35–42. (Abstract in Expt. Sta. Rec. 59: 191–192.)

Corn (Maize) and Mill Products. *See* Bread.

Corn (Maize) Oil. *See* Bread.

Cottonseed Oil. *See* Bread.

Cowpeas, Sprouted. *See* Cactus.

Cranberry Juice. *See* Cauliflower.

Cream. *See* Butter.

Cucumbers. *See* Chicos.

Dandelion Greens. *See* Cauliflower.

Dasheens (Taros). *See* Limu.

Endive. *See* Cauliflower.

Glucose. *See* Bread.

Grape Juice, Dried.
(1) Givens, M. H., and Macy, I. G.
1921. the antiscorbutic property of some desiccated fruit juices. Amer. Soc. Biol. Chem. Proc. 15: XI–XII. (*In* Jour. Biol. Chem. 46: XI–XII.) (Abstract in Expt. Sta. Rec. 46: 359.)

Grape Juice, Fresh.
(1) Chick, H., and Rhodes, M.
1918. an investigation of the antiscorbutic value of the raw juices of root vegetables, with a view to their adoption as an adjunct to the dietary of infants. Lancet [London] 195: 774–775. (Abstract in Expt. Sta. Rec. 41: 860–861.)

Grapefruit Juice, Dried. *See* Grape Juice, Dried.

Grapefruit Juice, Fresh. *See* Bananas, Raw (1).

Grapes. *See* Grape Juice, Fresh.

Guavas. *See* Chicos.

Ham. *See* Bread.

Heart. *See* Bread.

Honey.
(1) Kifer, H. B., and Munsell, H. E.
1929. vitamin content of honey and honeycomb. Jour. Agr. Research [U. S.] 39: 355–366, illus.

Horse Fat. *See* Bread.

Kidney. *See* Bread.

Kohl-rabi. *See* Cauliflower.

Lard. *See* Bread.

Vitamin C occurrence—Continued

Lemon Juice, Concentrated.
(1) ZILVA, S. S.
1924. A NOTE ON THE CONSERVATION OF THE POTENCY OF CONCENTRATED ANTISCORBUTIC PREPARATIONS. II. Biochem. Jour. 18: [186]–187. (Abstract in Expt. Sta. Rec. 51: 568.)

Lemon Juice, Dried. *See* Grape Juice, Dried.

Lemon Peel, Outer.
(1) WILLIMOTT, S. G., and WOKES, F.
1926. THE VITAMIN C OF LEMON RIND. Biochem. Jour. 20: [1013]–1015. (Abstract in Expt. Sta. Rec. 56: 696.)

Lemons and Lemon Juice, Fresh and Stored.
(1) DELF, E. M.
1925. THE INFLUENCE OF STORAGE ON THE ANTISCURVY VALUE OF FRUITS AND VEGETABLE JUICES. Biochem. Jour. 19: [141]–152, illus. (Abstract in Expt. Sta. Rec. 53: 567–568.)
(2) *See* Apples, Raw.

Lentils, Dried and Sprouted.
(1) CHICK, H., and DELF, E. M.
1919. THE ANTISCORBUTIC VALUE OF DRY AND GERMINATED SEEDS. Biochem. Jour. 13: [199]–218, illus. (Abstract in Expt. Sta. Rec. 42: 57.)

Lettuce. *See* Cauliflower.

Lime Juice, Concentrated.
(1) HARDEN, A., and ROBISON, R.
1919. THE ANTISCORBUTIC PROPERTIES OF CONCENTRATED FRUIT JUICES. Jour. Roy. Army Med. Corps 32: 48–56. (Abstract in Expt. Sta. Rec. 41: 470.)

Lime Juice, Fresh.
(1) DAVEY, A. J.
1921. DETERMINATION OF THE MINIMUM DOSES OF SOME FRESH CITRUS FRUIT JUICES WHICH WILL PROTECT A GUINEA PIG FROM SCURVY, TOGETHER WITH SOME OBSERVATIONS ON THE PRESERVATION OF SUCH JUICES. Biochem. Jour. 15: [83]–103. (Abstract in Expt. Sta. Rec. 45: 869.)

Limu.
(1) MILLER, C. D.
1927. FOOD VALUES OF POI, TARO, AND LIMU. Bernice P. Bishop Mus. Bul. 37, 25 p., illus. (Abstract in Expt. Sta. Rec. 58: 83–84.)

Liver, Chicken.
(1) HART, E. B., STEENBOCK, H., LEPKOVSKY, S., and HALPIN, J. G.
1925. THE NUTRITIONAL REQUIREMENT OF THE CHICKEN. VI. DOES THE CHICKEN REQUIRE VITAMIN C? Jour. Biol. Chem. 66: 813–818, illus. (Abstract in Expt. Sta. Rec. 56: 768.)

Malt and Malt Extract.
(1) MCCLENDON, J. F., COLE, W. C. C., ENGSTRAND, O., and MIDDLEKAUFF, J. E.
1919. THE EFFECTS OF MALT AND MALT EXTRACTS ON SCURVY AND THE ALKALINE RESERVE OF THE BLOOD. Jour. Biol. Chem. 40: 243–258, illus. (Abstract in Expt. Sta. Rec. 42: 463.)
(2) RANDOIN, L., and LECOQ, R.
1927. LE MALT ET L'EXTRAIT DE MALT ENVISAGÉS COMME SOURCES DE VITAMINES HYDROSOLUBLES B ET C. Bul. Soc. Chim. Biol. 9: [49]–58, illus. (Abstract in Expt. Sta. Rec. 56: 894–895.)

Mangos, Dried.
(1) CHICK, H., HUME, E. M., and SKELTON, R. F.
1919. II. THE ANTISCORBUTIC VALUE OF SOME INDIAN DRIED FRUITS: (A) TAMARIND, (B) COCUM, AND (C) MANGO ("AMCHUR"). Lancet [London] 197: 322–323. (Abstract in Expt. Sta. 42: 163.)

Margarins. *See* Bread.

Milk, Cow's, Skim.
(1) JOHNSON, J. M., and HOOPER, C. W.
1922. THE COMPARATIVE ANTISCORBUTIC VALUES OF MILK. Pub. Health Rpts. [U. S.] 37: 989–1020, illus. (Abstract in Expt. Sta. Rec. 47: 267.)

Vitamin C occurrence—Continued

Milk, Cow's, Whole, Condensed.
(1) HUME, E. M.
1921. INVESTIGATION OF THE ANTISCORBUTIC VALUE OF FULL CREAM SWEETENED CONDENSED MILK BY EXPERIMENTS WITH MONKEYS. Biochem. Jour. 15: [163]–166. (Abstract in Expt. Sta. Rec. 45: 870.)

Milk, Cow's, Whole, Dried.
(1) CAVANAUGH, G. W., DUTCHER, R. A., and HALL, J. S.
1924. ANTISCORBUTIC POTENCY OF WHOLE-MILK POWDER. Indus. and Engin. Chem. 16: 1070–1073, illus. (Abstract in Expt. Sta. Rec. 53: 165.)
(2) SUPPLEE, G. C., and DOW, O. D.
1926. VARIATIONS IN THE ANTISCORBUTIC PROPERTIES OF DRY MILK. Amer. Jour. Diseases Children 31: [41]–50, illus. (Abstract in Expt. Sta. Rec. 55: 193.)

Milk, Cow's, Whole, Evaporated. *See* Milk, Cow's, Whole, Dried (1).

Milk, Cow's, Whole, Irradiated.
(1) HOTTINGER, A.
1927. ÜBER DEN EINFLUSS DES ULTRAVIOLETTEN LICHTES AUF DEN C-VITAMINGEHALT DER MILCH. Klin. Wchnchr. 6: 1793–1797, illus. (Abstract in Expt. Sta. Rec. 59: 92–93.)
(2) SUPPLEE, G. C., and DOW, O. D.
1927. ANTIRACHITIC PROPERTIES OF IRRADIATED DRY MILK. Amer. Jour. Diseases Children 34: [364]–371, illus. (Abstract in Expt. Sta. Rec. 57: 692–693.)

Milk, Cow's, Whole, Pasteurized. *See* Milk, Cow's, Whole, Dried (1).

Milk, Cow's, Whole, Raw.
(1) KIEFERLE, F., and ZEILER, K.
1926. DIE ANTISKORBUTISCHE FÄHIGKEIT DER SILAGEMILCH, IHRE BIOLOGISCHE WERTUNG IM VERGLEICH MIT TROCKENFUTTER- UND SCHLEMPE-TREBERMILCH UND IHRE EIGNUNG ALS KINDERMILCH. Fortschr. Landw. 1: 83–90, illus.
(2) *See* Apples, Raw.
(3) MACLEOD, F. L.
1927. ANTISCORBUTIC VITAMIN CONTENT OF MILK OF STALL-FED COWS THROUGHOUT A YEAR. PROBABILITY THAT ENSILAGE IS AN IMPORTANT SOURCE OF THIS VITAMIN. Jour. Amer. Med. Assoc. 88: 1947–1949. (Abstract in Expt. Sta. Rec. 57: 869.)

Milk, Cow's, Whole, Scalded.
(1) BARNES, R. E., and HUME, E. M.
1919. RELATIVE ANTISCORBUTIC VALUE OF FRESH, DRIED AND HEATED COW'S MILK. Biochem. Jour. 13: [306]–328, illus. (Abstract in Expt. Sta. Rec. 42: 760.)

Milk, Goat's.
(1) HUNT, C. H., and WINTER, A. R.
1922. COW'S MILK VERSUS GOAT'S MILK AS A SOURCE OF THE ANTISCORBUTIC VITAMIN. (Abstract) Science (n. s.) 56: 114.
(2) MEYER, L. F., and NASSAU, E.
1924. EXPERIMENTELLE UNTERSUCHUNGEN ÜBER DEN VITAMINGEHALT DER MILCH. Klin. Wchnchr. 3: 2132–2135, illus. (Abstract in Expt. Sta. Rec. 53: 265.)

Milk, Human.
(1) MEYER, L. F., and NASSAU, E.
1925. ÜBER DEN VITAMINGEHALT DER FRAUENMILCH. Klin. Wchnchr. 4: 2380–2383 illus. (Abstract in Expt. Sta. Rec. 55: 193.)

Molasses. *See* Bread.

Mulberries. *See* Cauliflower.

Mushrooms.
(1) STEIDLE, H.
1924. BESITZEN ESSBARE PILZE ANTISKORBUTISCHE WIRKUNG? Biochem. Ztschr. 151: [181]–186, illus. (Abstract in Expt. Sta. Rec. 53: 62.)

Mutton Fat. *See* Bread.

Oatmeal. *See* Bread.

Oats. *See* Barley.

Oleo Oil. *See* Bread.

Vitamin C occurrence—Continued

Olive Oil. *See* Bread.

Onions.

(1) Chick, H., and Hume, E. M.
1917. THE DISTRIBUTION AMONG FOODSTUFFS (ESPECIALLY THOSE SUITABLE FOR THE RATIONING OF ARMIES) OF THE SUBSTANCES REQUIRED FOR THE PREVENTION OF (A) BERIBERI AND (B) SCURVY. Jour. Roy. Army Med. Corps 29: [121]–159, illus. (Abstract in Expt. Sta. Rec. 40: 868–869.)

Orange Juice, Concentrated.

(1) Goss, H.
1925. THE ANTISCORBUTIC VALUE OF COMMERCIALLY CONCENTRATED ORANGE JUICE. Hilgardia 1: [15]–34, illus. (Abstract in Expt. Sta. Rec. 53: 458.)

(2) Priston, J. L.
1926. THE PREVENTION OF SCURVY IN THE NAVY. Jour. Roy. Naval Med. Serv. 12: [1]–20. (Abstract in Expt. Sta. Rec. 55: 194.)

Orange Juice, Dried. *See* Grape juice, dried.

Orange Peel, Dried and Fresh.

(1) Hess, A. F., and Unger, L. J.
1918. THE SCURVY OF GUINEA PIGS. I. THE EXPERIMENTAL DIETARY. II. EXPERIMENTS ON THE EFFECT OF THE ADDITION OF FRUITS AND VEGETABLES TO THE DIETARY. Jour. Biol. Chem. 35: 479–496, illus. (Abstract in Expt. Sta. Rec. 39: 771–772.)

Orange Peel, Outer.

(1) Willimott, S. G., and Wokes, F.
1927. SOME CONSTITUENTS OF CITRUS FRUITS. Pharm. Jour. and Pharm. [London] (ser. 4, v. 64) 118: 770–773, illus. (Abstract in Expt. Sta. Rec. 59: 93–94.)

Oranges and Orange Juice, Fresh and Stored.

(1) *See* Cactus.
(2) *See* Lemons and Lemon Juice, Fresh and Stored (1) and (2).

Oysters.

(1) Randoin, L.
1923. ÉTUDE DES VITAMINES CHEZ LES MOLLUSQUES. SUR LA PRÉSENCE DU FACTEUR ANTISCORBUTIQUE DANS L'HUÎTRE. Compt. Rend. Acad. Sci. [Paris] 177: 498–501, illus. (Abstract in Expt. Sta. Rec. 50: 465.)

Papayas and Papaya Juice.

(1) *See* Cactus.
(2) Miller, C. D.
1926. THE VITAMINS (A, B, AND C) OF PAPAYA. Biochem. Jour. 20: [515]–518. (Abstract in Expt. Sta. Rec. 56: 87.)

Peaches, Canned and Cooked.

(1) Kohman, E. F., Eddy, W. H., Carlsson, V., and Halliday, N.
1926. VITAMINS IN CANNED FOODS. V. PEACHES. Indus. and Engin. Chem. 18: 302–303, illus. (Abstract in Expt. Sta. Rec. 55: 793–794.)

(2) Kansas Agricultural Experiment Station.
1928. THE VITAMIN CONTENT OF SOME COMMON FRUITS AND VEGETABLES. Kans. Agr. Expt. Sta. Rpt. 1926–1928: 123–124.

Peaches, Dried.

(1) Eckman, P. F.
1922. THE ANTISCORBUTIC VALUE OF DEHYDRATED FRUITS. Jour. Amer. Med. Assoc. 78: 635–636, illus. (Abstract in Expt. Sta. Rec. 47: 62.)

Peaches, Raw. *See* Cactus.

Peanut Oil. *See* Bread.

Pears, Canned, Cooked, and Raw.

(1) *See* Peaches, Canned and Cooked (2).
(2) Craven, V. C., and Kramer, M. M.
1927. THE VITAMIN C CONTENT OF FRESH AND CANNED PEAR. Jour. Agr. Research [U. S.] 34: 385–392, illus. (Abstract in Expt. Sta. Rec. 57: 392–393.)

Peas, Canned. *See* Beans, Kidney, Canned.

Vitamin C occurrence—Continued

Peas, Green, Canned, Cooked, and Raw.
(1) Eddy, W. H., Kohman, E. F., and Carlsson, V.
1926. VITAMINS IN CANNED FOODS. IV. GREEN PEAS. Indus. and Engin. Chem. 18: 85–89, illus. (Abstract in Expt. Sta. Rec. 55: 793–794.)

Peas, Sprouted.
(1) *See* Lentils, Dried and Sprouted.
(2) *See* Beans, Sprouted.

Peppers, Green. *See* Beans, String, Raw (2).

Persimmons, Chinese.
(1) *See* Chicos.
(2) Iwasaki, Y.
1927. ON THE CONTENT OF VITAMIN C IN JAPAN SAND PEAR (PYRUS SEROTINA, REHDER) KAKI (DIOSPYROS KAKI, I) AND SATSUMA ORANGE (CITRUS UNSHIU). Jour. Okitsu Hort. Soc. No. 22, 10 p., illus. [In Japanese, English summary, p. 9–10.] (Abstract in Expt. Sta. Rec. 57: 197.)
(3) Hsü, K. L.
1928. THE ANTISCORBUTIC VITAMIN VALUE OF SOME PEKING FRUITS. Chinese Jour. Physiol. 2: 41–44, illus.

Pig Kidney Fat. *See* Bread.

Pineapples, Canned.
(1) Miller, C. D.
1925. VITAMIN C IN FRESH AND CANNED PINEAPPLE. Jour. Home Econ. 17: 377–382, illus. (Abstract in Expt. Sta. Rec. 55: 89.)

Pineapples, Raw.
(1) *See* Cactus.
(2) *See* Pineapples, Canned.

Poi. *See* Limu.

Pork. *See* Bread.

Potatoes.
(1) *See* Cauliflower.
(2) *See* Onions.
(3) *See* Apples, Raw.

Prunes, Dried. *See* Orange Peel, Dried and Fresh.

Pumpkin. *See* Cactus.

Radishes.
(1) Shimoda, Fujimaki, and Saiki, S.
1927. TENEUR EN VITAMINES DES PRODUITS ALIMENTAIRES JAPONAIS. Bul. Soc. Sci. Hyg. Aliment. 15: [524]–530. (Abstract in Expt. Sta. Rec. 59: 594.)

Raisins.
(1) Dutcher, R. A., and Outhouse, J.
1923. THE VITAMIN CONTENT OF RAISINS AND RAISIN BY-PRODUCTS. Penn. Agr. Expt. Sta. Bul. 181: 18. (Abstract in Expt. Sta. Rec. 50: 463.)

Raspberries, Canned and Raw. *See* Cauliflower.

Raspberry Juice, Dried. *See* Grape Juice, Dried.

Rhubarb.
(1) Pierson, E. M., and Dutcher, R. A.
1920. RHUBARB AS AN ANTISCORBUTIC. (Abstract) Science (n. s.) 51: 70.

Rice. *See* Bread.

Rutabagas.
(1) Delf, E. M.
1920. EFFECT OF HEAT ON THE ANTISCORBUTIC ACCESSORY FACTOR OF VEGETABLE AND FRUIT JUICES. Biochem. Jour. 14: [211]–228, illus. (Abstract in Expt. Sta. Rec. 43: 567–568.)
(2) *See* Lemons and Lemon Juice, Fresh and Stored (1).

Rye Germ.
(1) Scheunert, A.
1927. ÜBER DEN GEHALT VON WEIZEN- UND ROGGENKEIMEN AN VITAMINEN. Biochem. Ztschr. 183: [113]–121, illus. (Abstract in Expt. Sta. Rec. 58: 87.)

Rye, Whole. *See* Bread.

Sapodillas. *See* Chicos.

Vitamin C occurrence—Continued

Sauerkraut.
(1) Wisconsin Agricultural Experiment Station.
1929. TESTS SHOW HOMEMADE SAUERKRAUT A SOURCE OF VITAMIN C. Wis. Agr. Expt. Sta. Bul. 405: 48.

Soybeans. *See* Barley.

Soybeans, Sprouted. *See* Cactus.

Spinach, Canned, Cooked, and Raw.
(1) Eddy, W. H., Kohman, E. F., and Carlsson, V.
1925. VITAMINS IN CANNED FOODS. III. CANNED SPINACH. Indus. and Engin. Chem. 17: 69–74, illus. (Abstract in Expt. Sta. Rec. 53: 764.)
(2) Pierson, E.
[1926.] VITAMIN CONTENT OF CANNED SPINACH. S. Dak. Agr. Expt. Sta. Ann. Rpt. 1925/26: 23. (Abstract in Expt. Sta. Rec. 56: 696.)
(3) South Dakota Agricultural Experiment Station.
1927. VITAMIN C CONTENT OF CANNED SPINACH. S. Dak. Agr. Expt. Sta. Ann. Rpt. 1926/27: 14. (Abstract in Expt. Sta. Rec. 58: 794.)
(4) *See* Beans, Kidney, Canned.

Strawberries, Canned and Raw.
(1) Kohman, E. F., Eddy, W. H., and Halliday, N.
1928. VITAMINS IN CANNED FOODS. VI. STRAWBERRIES. Indus. and Engin. Chem. 20: 202–204, illus. (Abstract in Expt. Sta. Rec. 59: 94.)

Sugar. *See* Bread.

Sweet Potatoes. *See* Cactus.

Sweet Potatoes, Leaves. *See* Cactus.

Tamarind, Dried. *See* Mangos, Dried.

Tangerines. *See* Cactus.

Taro. *See* Limu.

Tea Infusion, Black and Green.
(1) Mattill, H. A., and Pratt, A. D.
1928. NOTE ON TEA AS A SOURCE OF VITAMIN C. Soc. Expt. Biol. and Med. Proc. 26: 82–85. (Abstract in Expt. Sta. Rec. 60: 594–595.)
(2) Munsell, H. E., and Kifer, H. B.
1929. GREEN TEA AS A SOURCE OF VITAMIN C. Jour. Home Econ. 21: 514–518, illus.

Togi. *See* Beans, Mung, Sprouted.

Tomato Concentrate.
(1) Kohman, E. F.
1928. RESEARCH FINDINGS ON CORROSION AND VITAMIN DESTRUCTION. Canning Age 9: 227–231, illus. (Abstract in Expt. Sta. Rec. 59: 94.)

Tomato Juice, Dried. *See* Grape Juice, Dried.

Tomatoes, Green; Air, Ethylene, and Vine Ripened.
(1) House, M. C., Nelson, P. M., and Haber, E. S.
1929. THE VITAMIN A, B, AND C CONTENT OF ARTIFICIALLY VERSUS NATURALLY RIPENED TOMATOES. Jour. Biol. Chem. 81: 495–504, illus. (Abstract in Expt. Sta. Rec. 61: 494.)
(2) Wisconsin Agricultural Experiment Station.
1929. ETHYLENE GAS INCREASES VITAMIN CONTENT OF TOMATOES. Wis. Agr. Expt. Sta. Bul. 405: 48–49.

Tomatoes, Green, Canned, Pickled, and Raw.
(1) Wisconsin Agricultural Experiment Station.
1927. [THE VITAMIN C CONTENT OF TOMATOES.] Wis. Agr. Expt. Sta. Bul. 396: 45. (Abstract in Expt. Sta. Rec. 59: 94.)

Tomatoes, Ripe, Canned and Raw.
(1) Sherman, H. C., LaMer, V. K., and Campbell, H. L.
1922. THE QUANTITATIVE DETERMINATION OF THE ANTISCORBUTIC VITAMIN (VITAMIN C). Jour. Amer. Chem. Soc. 44: 165–172, illus. (Abstract in Expt. Sta. Rec. 46: 865.)
(2) Delf, E. M.
1924. THE ANTISCORBUTIC VALUE OF FRESH AND CANNED ENGLISH TOMATOES. Biochem. Jour. 18: [674]–678. (Abstract in Expt. Sta. Rec. 52: 863–864.)

Vitamin C occurrence—Continued

Tomatoes, Ripe, Canned and Raw—Continued.
(3) *See* Apples, Raw.
Turnip Greens, Cooked and Raw. *See* Collards.
Turnips, White. *See* Beets, root.
Vegetable Marrow. *See* Cactus.
Watercress.
(1) Coward, K. H., and Eggleton, P.
1928. THE CONTENT OF VITAMINS A AND C IN WATERCRESS. Lancet [London] 214 (5446): 97–98, illus.
Wheat and Mill Products. *See* Cauliflower.
Wheat Germ. *See* Rye Germ.
Yeast and Yeast Extract.
(1) Chick, H., and Hume, M.
1917. THE DISTRIBUTION AMONG FOODSTUFFS (ESPECIALLY THOSE SUITABLE FOR THE RATIONING OF ARMIES) OF THE SUBSTANCES REQUIRED FOR THE PREVENTION OF (A) BERIBERI AND (B) SCURVY. Soc. Trop. Med. and Hyg. Trans. 10: [141]–186, illus.

LITERATURE REFERENCES ON THE OCCURRENCE OF VITAMIN D

Brains, Irradiated.
(1) Hess, A. F.
1927. ANTIRACHITIC ACTIVITY OF IRRADIATED CHOLESTEROL, ERGOSTEROL, AND ALLIED SUBSTANCES. Jour. Amer. Med. Assoc. 89: 337–339. (Abstract in Expt. Sta. Rec. 57: 792.)
Butter.
(1) Jones, J. H., Steenbock, H., and Nelson, M. T.
1924. FAT SOLUBLE VITAMINS. XXII. THE COMPARATIVE AMOUNTS OF VITAMIN A AND ANTIRACHITIC FACTOR IN BUTTER FAT AND COD LIVER OIL. Jour. Metabolic Research 6: [169]–187, illus. (Abstract in Expt. Sta. Rec. 56: 490–491.)
(2) McCollum, E. V., Simmonds, N., Becker, J. E., and Shipley, P. G.
1926. STUDIES ON EXPERIMENTAL RICKETS. XXVII. VARIATION OF VITAMIN D CONTENT OF BUTTER FAT AS A FACTOR IN THE DEVELOPMENT OF RICKETS INDUCED BY DIETS SUITABLE FOR PREPARING RATS FOR THE LINE TEST. Jour. Biol. Chem. 70: 437–438. (Abstract in Expt. Sta. Rec. 56: 296.)
Carrots.
(1) Sherman, H. C., and Hessler, M. C.
1927. QUANTITATIVE DIFFERENTIATION OF VITAMINS A AND D. I. Jour. Biol. Chem. 73: 113–120. (Abstract in Expt. Sta. Rec. 57: 293–294.)
Chicken Fat.
(1) Hess, A. F., and Weinstock, M.
1927. A STUDY OF THE ANTIRACHITIC FACTOR IN HUMAN AND IN COW'S MILK. Amer. Jour. Diseases Children 34: [845]–853. (Abstract in Expt. Sta. Rec. 58: 495.)
Chicken Liver. *See* Chicken Fat.
Clams.
(1) Jones, D. B., Nelson, E. M., and Murphy, J. C.
1928. BIOLOGICAL VALUES OF CERTAIN TYPES OF SEA FOODS. III. VITAMINS IN CLAMS. Indus. and Engin. Chem. 20: 648–652, illus. (Abstract in Expt. Sta. Rec. 59: 688.)
Coconut Oil, Irradiated.
(1) Steenbock, H., and Black, A.
1925. FAT-SOLUBLE VITAMINS. XXIII. THE INDUCTION OF GROWTH-PROMOTING AND CALCIFYING PROPERTIES IN FATS AND THEIR UNSAPONIFIABLE CONSTITUENTS BY EXPOSURE TO LIGHT. Jour. Biol. Chem. 64: 263–298, illus. (Abstract in Expt. Sta. Rec. 54: 489–490.)
Cod-liver Oil.
(1) *See* Butter (1).
(2) Heuser, G. F., and Norris, L. C.
1926. RICKETS IN CHICKS. I. VARIATIONS IN THE ANTIRACHITIC POTENCY OF DIFFERENT BRANDS OF COD-LIVER OIL. Poultry Sci. 6: 9–17, illus. (Abstract in Expt. Sta. Rec. 56: 478.)

Vitamin D occurrence—Continued

Cod-liver Oil Concentrates.

(1) ZUCKER, T. F.

1922. FURTHER OBSERVATIONS ON THE CHEMISTRY OF COD-LIVER OIL. Soc. Expt. Biol. and Med. Proc. 20: 136. (Abstract in Expt. Sta. Rec. 49: 608.)

(2) CHAPLIN, H.

1924. CLINICAL EXPERIENCE WITH THE ACTIVE PRINCIPLE OF COD-LIVER OIL. Soc. Expt. Biol. and Med. Proc. 21: 332–333. (Abstract in Expt. Sta. Rec. 52: 263.)

(3) DUBIN, H. E.

1927. NUTRITIONAL VALUE AND STANDARDIZATION OF COD-LIVER OIL AND OF ITS NON-SAPONIFIABLE FAT-SOLUBLE VITAMINE CONCENTRATE (OSCODAL). Jour. Amer. Pharm. Assoc. 16: 41–45. (Abstract in Expt. Sta. Rec. 57: 691.)

(4) MUNSELL, H. E., and BLACK, H.

1928. THE "ASSAY OF A SO-CALLED COD-LIVER OIL EXTRACT" FOR VITAMIN A CONTENT AND CALCIFYING PROPERTIES COMPARED TO COD-LIVER OIL. Jour. Amer. Pharm. Assoc. 17: 139–144, illus. (Abstract in Expt. Sta. Rec. 59: 492–493.)

Corn (Maize).

(1) STEENBOCK, H., BLACK, A., and THOMAS, B. H.

1927. CEREALS AND RICKETS. Indus. and Engin. Chem. 19: 906–907. (Abstract in Expt. Sta. Rec. 57: 898.)

Corn (Maize), Irradiated.

(1) STEENBOCK, H., and DANIELS, A. L.

1925. IRRADIATED FOODS AND IRRADIATED ORGANIC COMPOUNDS. THERAPEUTIC POSSIBILITIES. Jour. Amer. Med. Assoc. 84: [1093]–1097, illus. (Abstract in Expt. Sta. Rec. 53: 568.)

Corn (Maize) Oil, Irradiated. *See* Coconut Oil, Irradiated.

Cornstarch, Irradiated. *See* Corn (Maize), Irradiated.

Cottonseed Oil, Irradiated.

(1) HESS, A. F., and WEINSTOCK, M.

1924. ANTIRACHITIC PROPERTIES IMPARTED TO INERT FLUIDS BY ULTRAVIOLET IRRADIATION. Jour. Amer. Med. Assoc. 83: 1845–1846. (Abstract in Expt. Sta. Rec. 52: 762.)

Cream. *See* Chicken Fat.

Egg Yolk, Boiled, Dried, and Raw.

(1) HESS, A. F., and WEINSTOCK, M.

1924. FURTHER EXPERIMENTS ON THE ANTIRACHITIC ACTION OF YOLK OF EGG. Soc. Expt. Biol. and Med. Proc. 21: 441–442. (Abstract in Expt. Sta. Rec. 52: 263.)

Egg Yolk from Eggs Stored in Waterglass.

(1) WISCONSIN AGRICULTURAL EXPERIMENT STATION.

1927. DOES STORAGE IMPAIR ANTIRACHITIC VITAMIN IN EGG YOLK? Wis. Agr. Expt. Sta. Bul. 396: 46. (Abstract in Expt. Sta. Rec. 59: 96.)

Egg Yolk, Raw.

(1) CASPARIS, H., SHIPLEY, P. G., and KRAMER, B.

1923. THE ANTIRACHITIC INFLUENCE OF EGG YOLK. Jour. Amer. Med. Assoc. 81: 818–819. (Abstract in Expt. Sta. Rec. 50: 166.)

(2) HESS, A. F.

1923. THE THERAPEUTIC VALUE OF EGG YOLK IN RICKETS. Jour. Amer. Med. Assoc. 81: 15–17, illus. (Abstract in Expt. Sta. Rec. 50: 165–166.)

(3) BETHKE, R. M., KENNARD, D. C., and SASSAMAN, H. L.

1927. THE FAT-SOLUBLE VITAMIN CONTENT OF HEN'S EGG YOLK AS AFFECTED BY THE RATION AND MANAGEMENT OF THE LAYERS. Jour. Biol. Chem. 72: 695–706, illus. (Abstract in Expt. Sta. Rec. 57: 791.)

Eggs, Chinese Preserved (Pidan).

(1) TSO, E.

1926. THE EFFECT OF CHEMICAL PRESERVATION OF EGGS UPON THE STABILITY OF THEIR VITAMIN CONTENTS. Biochem. Jour. 20: [17]–22, illus. (Abstract in Expt. Sta. Rec. 55: 594.)

Vitamin D occurrence—Continued

Eggs, Whole, from Nonirradiated and Irradiated Hens.
(1) Hart, E. B., Steenbock, H., Lepkovsky, S., Kletzien, S. W. F., Halpin, J. G., and Johnson, O. N.
1925. the nutritional requirement of the chicken. v. the influence of ultra-violet light on the production, hatchability, and fertility of the egg. Jour. Biol. Chem. 65: 579–595, illus. (Abstract in Expt. Sta. Rec. 55: 867.)
(2) Hughes, J. S., Payne, L. F., Titus, R. W., and Moore, J. M.
1925. the relation between the amount of ultra-violet light received by hens and the amount of antirachitic vitamin in the eggs produced. Jour. Biol. Chem. 66: 595–600. (Abstract in Expt. Sta. Rec. 56: 768.)

Fish Fats.
(1) Bills, C. E.
1927. antiricketic substances. vi. the distribution of vitamin d, with some notes on its possible origin. Jour. Biol. Chem. 72: 751–758. (Abstract in Expt. Sta. Rec. 57: 294–295.)
(2) Rosenheim, O., and Webster, T. A.
1927. the sources of supply of vitamins a and d. Nature [London] 120: 440. (Abstract in Expt. Sta. Rec. 58: 293–294.)

Fish-liver Oils.
(1) *See* Cod-liver Oil (1).
(2) Hess, A. F., and Weinstock, M.
1926. puffer fish oil; a very potent antirachitic; its elaboration by fish deprived of sunlight. Soc. Expt. Biol. and Med. Proc. 23: [407]–408. (Abstract in Expt. Sta. Rec. 56: 296.)
(3) *See* Fish Fats (1).
(4) Clow, B., and Marlatt, A.
1929. the antirachitic factor in burbot-liver oil. Indus. and Engin. Chem. 21: 281–282.

Flour, Patent, Irradiated.
(1) Hess, A. F., and Weinstock, M.
1925. a further report on imparting antirachitic properties to inert substances by ultra-violet irradiation. Jour. Biol. Chem. 63:297–304. (Abstract in Expt. Sta. Rec. 53: 568.)
(2) *See* Corn (Maize), Irradiated.

Lard, Irradiated. *See* **Coconut Oil, Irradiated.**

Lettuce, Irradiated.
(1) *See* Cottonseed Oil, Irradiated.
(2) *See* Flour, Patent, Irradiated.

Liver, Irradiated.
(1) Steenbock, H., and Black, A.
1924. fat-soluble vitamins. xvii. the induction of growth-promoting and calcifying properties in a ration by exposure to ultra-violet light. Jour. Biol. Chem. 61: 405–422, illus. (Abstract in Expt. Sta. Rec. 52: 862–863.)

Meat, Irradiated.
(1) *See* Liver, Irradiated.
(2) *See* Corn (Maize), Irradiated.

Milk, Cow's, Whole, Dried.
(1) Supplee, G. C., and Dow, O. D.
1927. the antirachitic and calcifying properties of summer and winter produced dry milk, irradiated and nonirradiated. Jour. Biol. Chem. 73: 617–622. (Abstract in Expt. Sta. Rec. 57: 491–492.)

Milk, Cow's, Whole, Dried and Irradiated.
(1) Hess, A. F.
1925. the antirachitic activation of foods and of cholesterol, by ultra-violet irradiation. Jour. Amer. Med. Assoc. 84: 1910–1913. (Abstract in Expt. Sta. Rec. 54: 92.)

Vitamin D occurrence—Continued

Milk, Cow's, Whole, Dried and Irradiated—Continued.
(2) MACKAY, H. M. M., and SHAW, H. F.
1925. FOODSTUFFS IRRADIATED WITH ULTRA-VIOLET LIGHT; THEIR EFFECT ON THE BONE LESIONS OF RACHITIC CHILDREN. Brit. Med. Jour. 3373: 344–345. (Abstract in Expt. Sta. Rec. 55: 387.)
(3) *See* Milk, Cow's, Whole, Dried.

Milk, Cow's, Whole, from Irradiated Cows.
(1) Steenbock, H., HART, E. B., HOPPERT, C. A., and BLACK, A.
1925. FAT-SOLUBLE VITAMIN. XXVI. THE ANTIRACHITIC PROPERTY OF MILK AND ITS INCREASE BY DIRECT IRRADIATION AND BY IRRADIATION OF THE ANIMAL. Jour. Biol. Chem. 66: 441–449. (Abstract in Expt. Sta. Rec. 56: 771.)
(2) GOWEN, J. W., MURRAY, J. M., GOOCH, M. E., and AMES, F. B.
1926. RICKETS, ULTRA-VIOLET LIGHT AND MILK. Science (n. s.) 63: 97–98. (Abstract in Expt. Sta. Rec. 55: 65.)

Milk, Cow's, Whole, Raw.
(1) BOAS, M. A., and CHICK, H.
1924. THE INFLUENCE OF DIET AND MANAGEMENT OF THE COW UPON THE DEPOSITION OF CALCIUM IN RATS RECEIVING A DAILY RATION OF THE MILK IN THEIR DIET. Biochem. Jour. 18: [433]–447, illus. (Abstract in Expt. Sta. Rec. 52: 176–177.)
(2) LUCE, E. M.
1924. FURTHER OBSERVATIONS ON THE INFLUENCE OF SUNLIGHT UPON THE GROWTH-PROMOTING AND ANTIRACHITIC PROPERTIES OF COW'S MILK. Biochem. Jour. 18: [1279]–1288, illus. (Abstract in Expt. Sta. Rec. 53: 177.)
(3) *See* Chicken Fat.
(4) OUTHOUSE, J., MACY, I. G., and BREKKE, V.
1928. HUMAN MILK STUDIES. V. A QUANTITATIVE COMPARISON OF THE ANTIRICKETIC FACTOR IN HUMAN MILK AND COW'S MILK. Jour. Biol. Chem. 78: 129–144, illus. (Abstract in Expt. Sta. Rec. 59: 690.)

Milk, Cow's, Whole, Raw, Irradiated.
(1) KRAMER, B.
1925. RICKETS IN INFANTS. TREATMENT WITH IRRADIATED MILK. Amer. Jour. Diseases Children 30: [195]–198, illus. (Abstract in Expt. Sta. Rec. 54: 492.)
(2) *See* Milk, Cow's, Whole, from Irradiated Cows (1).

Milk, Goat's. *See* Milk, Cow's, Whole, from Irradiated Cows (1).

Milk, Human.
(1) KENNEDY, C., and PALMER, L. S.
1925. THE ANTIRACHITIC PROPERTIES OF BREAST MILK. Soc. Expt. Biol. and Med. Proc. 23: [230]–231. (Abstract in Expt. Sta. Rec. 56: 91.)
(2) *See* Chicken Fat.
(3) HESS, A. F., WEINSTOCK, M., and SHERMAN, E.
1927. ANTIRACHITIC PROPERTIES DEVELOPED IN HUMAN MILK BY IRRADIATING THE MOTHER. Jour. Amer. Med. Assoc. 88: 24–26. (Abstract in Expt. Sta. Rec. 56: 593.)
(4) MCCOLLUM, E. V., SIMMONDS, N., BECKER, J. E., and SHIPLEY, P. G.
1927. STUDIES ON EXPERIMENTAL RICKETS. XXVIII. DOES VITAMIN D PASS INTO THE MILK? Amer. Jour. Diseases Children 33: [230]–243. (Abstract in Expt. Sta. Rec. 56: 796–797.)
(5) *See* Milk, Cow's, Whole, Raw (4).

Oatmeal. *See* Corn (Maize).

Oats, Rolled, Irradiated. *See* Corn (Maize), Irradiated.

Olive Oil, Irradiated. *See* Coconut Oil, Irradiated.

Orange Juice, Irradiated.
(1) MASLOW, H. L., SHELLING, D. H., and KRAMER, B.
1926. IRRADIATED ORANGE JUICE. ITS VALUE AS AN ANTIRACHITIC AGENT. Bul. Johns Hopkins Hosp. 39: 56–61. (Abstract in Expt. Sta. Rec. 56: 91.)

Vitamin D occurrence—Continued

Oysters, Canned and Raw.
(1) Russell, H. L., Morrison, F. B., and Ebling, W. H.
1926. ANTIRACHITIC CONTENT OF CANNED OYSTERS. Wis. Agr. Expt. Sta. Bul. 388: 124–125. (Abstract in Expt. Sta. Rec. 56: 794.)

Oysters, Raw, Frozen.
(1) Jones, D. B., Murphy, J. C., and Nelson, E. M.
1928. BIOLOGICAL VALUES OF CERTAIN TYPES OF SEA FOOD. II. VITAMINS IN OYSTERS (OSTREA VIRGINICA). Indus. and Engin. Chem. 20: 205–210, illus. (Abstract in Expt. Sta. Rec. 59: 95.)

Spinach, Irradiated.
(1) *See* Milk, Cow's, Whole, Dried and Irradiated.
(2) *See* Spinach, Raw (1).

Spinach, Raw.
(1) Chick, H., and Roscoe, M. H.
1926. THE ANTIRACHITIC VALUE OF FRESH SPINACH. Biochem. Jour. 20: [137]–152. (Abstract in Expt. Sta. Rec. 55: 891.)
(2) Roscoe, M. H.
1927. A FURTHER NOTE ON THE ANTIRACHITIC VALUE OF FRESH SPINACH. Biochem. Jour. 21: [211]–215. (Abstract in Expt. Sta. Rec. 57: 392.)

Wheat, Irradiated. *See* Corn (Maize), Irradiated.

Yeast Fat.
(1) Hume, E. M., Smith, H. H., and Smedley-MacLean, I.
1928. THE EXAMINATION OF YEAST FAT FOR THE PRESENCE OF VITAMINS A AND D BEFORE IRRADIATION AND OF VITAMIN D AFTER IRRADIATION. Biochem. Jour. 22: [27]–33, illus. (Abstract in Expt. Sta. Rec. 59: 595.)

Yeast, Irradiated. *See* Brains, Irradiated.

LITERATURE REFERENCES ON THE OCCURRENCE OF VITAMIN E

Bananas.
(1) Evans, H. M., and Burr, G. O.
1927. THE ANTISTERILITY VITAMINE FAT SOLUBLE E. Calif. Univ. Mem., v. 8, 176 p., illus.

Beef Muscle, Cooked or Raw.
(1) Evans, H. M., and Bishop, K. S.
1923. EXISTENCE OF A HITHERTO UNKNOWN DIETARY FACTOR ESSENTIAL FOR REPRODUCTION. Jour. Amer. Med. Assoc. 81: 889–892. (Abstract in Expt. Sta. Rec. 50: 261–262.)
(2) *See* Bananas.

Brains. *See* Bananas.

Butterfat.
(1) Mattill, H. A., and Clayton, M. M.
1926. VITAMIN E AND REPRODUCTION ON SYNTHETIC AND MILK DIETS. Jour. Biol. Chem. 68: 665–685. (Abstract in Expt. Sta. Rec. 56: 664–665.)
(2) *See* Bananas.
(3) Sure, B.
1927. DIETARY REQUIREMENTS FOR REPRODUCTION. XI. THE POTENCY OF BUTTERFAT IN VITAMIN E. Jour. Biol. Chem. 74: 71–84. (Abstract in Expt. Sta. Rec. 57: 897–898.)

Cocoa Butter. *See* Butterfat (3).

Coconut Oil. *See* Bananas.

Coconut Press Cake. *See* Bananas.

Corn (Maize).
(1) Sure, B.
1924. DIETARY REQUIREMENTS FOR REPRODUCTION. II. THE EXISTENCE OF A SPECIFIC VITAMIN FOR REPRODUCTION. Jour. Biol. Chem. 58: 693–709, illus. (Abstract in Expt. Sta. Rec. 51: 563–564.)
(2) Evans, H. M., and Burr, G. O.
1925. THE ANTISTERILITY VITAMINE FAT SOLUBLE E. Natl. Acad. Sci. Proc. 11: 334–341. (Abstract in Expt. Sta. Rec. 54: 561–562.)

Corn (Maize) Germ. *See* Bananas.

Vitamin E occurrence—Continued

Corn (Maize) Oil.
(1) *See* Bananas.
(2) *See* Butterfat (3).

Cottonseed Oil.
(1) SURE, B.
1926. DIETARY REQUIREMENTS FOR REPRODUCTION. V. THE RÔLE OF VARIOUS VEGETABLE AND FRUIT OILS IN FERTILITY AND LACTATION. Jour. Biol. Chem. 69: 29–40. (Abstract in Expt. Sta. Rec. 57: 896–897.)
(2) *See* Bananas.

Egg Yolk.
(1) *See* Beef Muscle (1).
(2) *See* Bananas.

Heart. *See* Bananas.

Kale.
(1) MILLER, H. G., and YATES, W. W.
1924. THE RELATION OF NATURAL FOODSTUFFS AND THEIR TREATMENT ON GROWTH AND REPRODUCTION. Jour. Biol. Chem. 62: 259–268, illus. (Abstract in Expt. Sta. Rec. 53: 62.)

Lettuce, Autoclaved. *See* Beef Muscle (1).

Lettuce, Dried. *See* Bananas.

Lettuce, Raw.
(1) *See* Beef Muscle (1).
(2) *See* Bananas.

Liver. *See* Bananas.

Milk, Dried and Raw.
(1) *See* Butterfat (1).
(2) *See* Bananas.

Mutton Fat. *See* Bananas.

Oats, Rolled.
(1) *See* Corn (Maize) (1) and (2).
(2) KENNEDY, W. P.
1926. REPRODUCTION AND DIET IN THE RAT. Quart. Jour. Expt. Physiol. 16: [281]–289.

Olive Oil. *See* Cottonseed Oil (1).

Orange Juice. *See* Bananas.

Peanut Oil.
(1) *See* Cottonseed Oil (1).
(2) *See* Bananas.

Peanuts, Raw. *See* Bananas.

Pig Muscle. *See* Bananas.

Soybean Oil. *See* Cottonseed Oil (1).

Vegetable Oil, Hydrogenated.
(1) KENNEDY, C., and PALMER, L. S.
1926. HYDROGENATED VEGETABLE OIL AS A SOURCE OF VITAMIN E. Amer. Jour. Physiol. 76: 316–319, illus. (Abstract in Expt. Sta. Rec. 55: 594.)
(2) *See* Bananas.

Viscera, Edible. *See* Bananas.

Wheat Germ.
(1) *See* Beef Muscle (1).
(2) *See* Bananas.

Wheat, Whole. *See* Bananas.

SELECTED LIST OF REFERENCES TO LITERATURE ON THE TECHNIC FOR THE QUANTITATIVE DETERMINATION OF THE VITAMINS

This list has been selected to include the methods and basal diets used in various laboratories which have made a special study of vitamin technic. All who are undertaking vitamin studies for the first time should familiarize themselves with the methods followed in those laboratories which have given special attention to the quantitative aspects of the subject.

GENERAL TECHNIC

Chick, H., and Hume, E. M.
1919. NOTE ON THE IMPORTANCE OF ACCURATE AND QUANTITATIVE MEASUREMENTS IN EXPERIMENTAL WORK ON NUTRITION AND ACCESSORY FOOD FACTORS. Jour. Biol. Chem. 39: 203–207. (Abstract in Expt. Sta. Rec. 42: 58–59.)

Macy, I. G., Outhouse, J., Long, M. L., and Graham, A.
1927. HUMAN MILK STUDIES. I. TECHNIQUE EMPLOYED IN VITAMIN STUDIES. Jour. Biol. Chem. 73: 153–174, illus. (Abstract in Expt. Sta. Rec. 57: 390.)

VITAMIN A TECHNIC

Chick, H.
1926. SOURCES OF ERROR IN THE TECHNIQUE EMPLOYED FOR THE BIOLOGICAL ASSAY OF FAT-SOLUBLE VITAMINS. Biochem. Jour. 20: [119]–130, illus. (Abstract in Expt. Sta. Rec. 55: 893.)

Coward, K. H., and Key, K. M.
1928. THE ASSAY OF VITAMIN A. Biochem. Jour. 22: [1019]–1025, illus. (Abstract in Expt. Sta. Rec. 60: 689.)

Drummond, J. C., Coward, K. H., and Handy, J.
1925. ON THE TECHNIQUE OF TESTING FOR THE PRESENCE OF VITAMIN A. Biochem. Jour. 19: [1068]–1074, illus. (Abstract in Expt. Sta. Rec. 55: 308.)

Dutcher, R. A., Honeywell, H. E., and Dahle, C. D.
1927. VITAMIN STUDIES. XVI. VITAMIN A IN EVAPORATED MILKS MADE BY VACUUM AND AERATION METHODS. Jour. Biol. Chem. 75: 85–94, illus. (Abstract in Expt. Sta. Rec. 58: 294–295.)

Hume, E. M., and Smith, H. H.
1928. A CRITICAL EXAMINATION OF METHODS OF EVALUATING VITAMIN A BY MEANS OF THE GROWTH OF RATS. Biochem. Jour. 22: [504]–521, illus. (Abstract in Expt. Sta. Rec. 60: 93–94.)

Macy, I. G., Outhouse, J., Graham, A., and Long, M. L.
1927. HUMAN MILK STUDIES. II. THE QUANTITATIVE ESTIMATION OF VITAMIN A. Jour. Biol. Chem. 73: 175–188, illus. (Abstract in Expt. Sta. Rec. 57: 390.)

Sherman, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., p. 455–457, illus. New York.

——— and Burtis, M. P.
1928. FACTORS AFFECTING THE ACCURACY OF THE QUANTITATIVE DETERMINATION OF VITAMIN A. Jour. Biol. Chem. 78: 671–680. (Abstract in Expt. Sta. Rec. 60: 194.)

——— and Munsell, H. E.
1925. THE QUANTITATIVE DETERMINATION OF VITAMIN A. Jour. Amer. Chem. Soc. 47: 1639–1646, illus. (Abstract in Expt. Sta. Rec. 54: 89.)

Smith, H. H., and Chick, H.
1926. MAINTENANCE OF A STANDARDIZED BREED OF YOUNG RATS FOR WORK UPON FAT-SOLUBLE VITAMINS, WITH PARTICUALR REFERENCE TO THE ENDOWMENT OF THE OFFSPRING. Biochem. Jour. 20: [131]–136. (Abstract in Expt. Sta. Rec. 55: 893.)

Steenbock, H., and Coward, K. H.
1927. FAT-SOLUBLE VITAMINS. XXVII. THE QUANTITATIVE DETERMINATION OF VITAMIN A. Jour. Biol. Chem. 72: 765–779, illus. (Abstract in Expt. Sta. Rec. 57: 392.)

VITAMIN A COLOR TESTS

Carr, F. H., and Price, E. A.
1926. COLOUR REACTIONS ATTRIBUTED TO VITAMIN A. Biochem. Jour. 20: [497]–501. (Abstract in Expt. Sta. Rec. 56: 10–11.)

Cocking, T. T., and Price, E. A.
1926. THE SEARCH FOR COLOUR REACTIONS OF VITAMIN "A." Pharm. Jour. and Pharm. [London] (ser. 4, v. 63) 117: 175–178. (Abstract in Expt. Sta. Rec. 56: 313.)

Rosenheim, O., and Drummond, J. C.
1925. A DELICATE COLOUR REACTION FOR THE PRESENCE OF VITAMIN A. Biochem. Jour. 19: [753]–756. (Abstract in Expt. Sta. Rec. 55: 307–308.)

ROSENHEIM, O., and WEBSTER, T. A.
1926. A CRITICAL STUDY OF COLOUR TESTS SUGGESTED FOR VITAMIN A. Lancet [London] 211: 806–807. (Abstract in Expt. Sta. Rec. 56: 410–411.)

WILLIMOTT, S. G., and WOKES, F.
1927. COLOUR TESTS FOR VITAMIN A. THEIR APPLICATION TO NATURALLY OCCURRING PRODUCTS. Lancet [London] 213 (5418): 8–11. (Abstract in Expt. Sta. Rec. 57: 690–691.)

——— S. G., MOORE, T., and WOKES, F.
1926. EFFECTS OF VARIOUS AGENTS ON COLOUR TESTS FOR VITAMIN A. Biochem. Jour. 20: [1292]–1298, illus. (Abstract in Expt. Sta. Rec. 56: 410.)

WOKES, F., and WILLIMOTT, S. G.
1927. A STUDY OF ANTIMONY TRICHLORIDE AS A POSSIBLE QUANTITATIVE REAGENT FOR VITAMIN A. Analyst 52: 515–524, illus. (Abstract in Expt. Sta. Rec. 59: 92.)

VITAMIN B TECHNIC

MACY, I. G., OUTHOUSE, J., GRAHAM, A., and LONG, M. L.
1927. HUMAN MILK STUDIES. III. THE QUANTITATIVE ESTIMATION OF VITAMIN B. Jour. Biol. Chem. 73: 189–201, illus. (Abstract in Expt. Sta. Rec. 57: 390–391.)

SHERMAN, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., p. 405–407. New York.

——— and GLOY, O. H. M.
1927. VITAMIN B DETERMINATION AND REQUIREMENT WITH SPECIAL REFERENCE TO PROTEIN INTAKE. Jour. Biol. Chem. 74: 117–122, illus. (Abstract in Expt. Sta. Rec. 57: 895–896.)

——— and MACARTHUR, E. H.
1927. A QUANTITATIVE STUDY OF THE DETERMINATION OF VITAMIN B. Jour. Biol. Chem. 74: 107–115, illus. (Abstract in Expt. Sta. Rec. 57: 895.)

——— and SPOHN, A.
1923. A CRITICAL INVESTIGATION AND AN APPLICATION OF THE RAT-GROWTH METHOD FOR THE STUDY OF VITAMIN B. Jour. Amer. Chem. Soc. 45: 2719–2728, illus. (Abstract in Expt. Sta. Rec. 51: 368–369.)

STEENBOCK, H., SELL, M. T., and NELSON, E. M.
1923. VITAMINE B. I. A MODIFIED TECHNIQUE IN THE USE OF THE RAT FOR DETERMINATIONS OF VITAMINE B. Jour. Biol. Chem. 55: 399–410, illus. (Abstract in Expt. Sta. Rec. 49: 665.)

——— SELL, M. T., and JONES, J. H.
1923. VITAMINE B. II. STORAGE OF VITAMINE B BY THE RAT. Jour. Biol. Chem. 55: 411–419, illus. (Abstract in Expt. Sta. Rec. 49: 665–666.)

SURE, B.
1928. DIETARY REQUIREMENTS FOR FERTILITY AND LACTATION. XIV. A QUANTITATIVE BIOLOGICAL METHOD FOR THE STUDY OF VITAMIN B REQUIREMENTS FOR LACTATION. Jour. Biol. Chem. 76: 673–683. (Abstract in Expt. Sta. Rec. 59: 490–491.)

VITAMINS F (B_1) AND G (B_2) TECHNIC

AYKROYD, W. R., and ROSCOE, M. H.
1929. THE DISTRIBUTION OF VITAMIN B_2 IN CERTAIN FOODS. Biochem. Jour. 23: 483–497, illus.

CHICK, H., and ROSCOE, M. H.
1927. ON THE COMPOSITE NATURE OF THE WATER-SOLUBLE B VITAMIN. Biochem. Jour. 21: [698]–711, illus. (Abstract in Expt. Sta. Rec. 57: 789–790.)

——— and ROSCOE, M. H.
1928. THE DUAL NATURE OF WATER-SOLUBLE VITAMIN B. II. THE EFFECT UPON YOUNG RATS OF VITAMIN B_2 DEFICIENCY AND A METHOD FOR THE BIOLOGICAL ASSAY OF VITAMIN B_2. Biochem. Jour. 22: [790]–799, illus. (Abstract in Expt. Sta. Rec. 60: 690.)

——— and ROSCOE, M. H.
1929. A METHOD FOR THE ASSAY OF THE ANTINEURITIC VITAMIN B_1, IN WHICH THE GROWTH OF YOUNG RATS IS USED AS A CRITERION. Biochem. Jour. 23: 498–503, illus.

EDDY, W. H.
1927. VITAMIN B TESTING REVISED. Soc. Expt. Biol. and Med. Proc. 25: 125–127. (Abstract in Expt. Sta. Rec. 58: 692.)
GOLDBERGER, J., and LILLIE, R. D.
1926. A NOTE ON AN EXPERIMENTAL PELLAGRALIKE CONDITION IN THE ALBINO RAT. Pub. Health Rpts. [U. S.] 41: 1025–1029.
——— WHEELER, G. A., LILLIE, R. D., and ROGERS, L. M.
1926. A FURTHER STUDY OF BUTTER, FRESH BEEF, AND YEAST AS PELLAGRA PREVENTIVES, WITH CONSIDERATION OF THE RELATION OF FACTOR P–P OF PELLAGRA (AND BLACK TONGUE OF DOGS) TO VITAMIN B. Pub. Health Rpts. [U. S.] 41: 297–318, illus. (Abstract in Expt. Sta. Rec. 55: 890–891.)
KINNERSLEY, H. W., and PETERS, R. A.
1928. ANTINEURITIC YEAST CONCENTRATES. IV. THE FURTHER PURIFICATION OF YEAST VITAMIN B_1 (CURATIVE). Biochem. Jour. 22: [419]–433. (Abstract in Expt. Sta. Rec. 60: 94–95.)
——— PETERS, R. A., and READER, V.
1928. ANTINEURITIC YEAST CONCENTRATES. III. THE CURATIVE PIGEON TEST. A CRITIQUE. Biochem. Jour. 22: [276]–291. (Abstract in Expt. Sta. Rec. 59: 294.)
SALMON, W. D.
1927. ON THE EXISTENCE OF TWO ACTIVE FACTORS IN THE VITAMIN B COMPLEX. Jour. Biol. Chem. 73: 483–497, illus. (Abstract in Expt. Sta. Rec. 57: 594.)
——— GUERRANT, N. B., and HAYS, I. M.
1928. ON THE EXISTENCE OF TWO ACTIVE FACTORS IN THE VITAMIN B COMPLEX. II. Jour. Biol. Chem. 76: 487–497, illus. (Abstract in Expt. Sta. Rec. 58: 894–895.)
SEIDELL, A.
1922. A PHYSIOLOGICAL TEST FOR THE ACTIVITY OF VITAMINE PREPARATIONS. Pub. Health Rpts. [U. S.] 37: 1519–1523. (Abstract in Expt. Sta. Rec. 48: 12.)
———
1926. COMPARAISON ENTRE LA MÉTHODE DU PIGEON ET CELLE DU RAT POUR L'ESSAI DE LA VITAMINE ANTINÉVRITIQUE. Bul. Soc. Chim. Biol. 8: [746]–750, illus. (Abstract in Expt. Sta. Rec. 56: 203–204.)
SHERMAN, H. C., and AXTMAYER, J. H.
1927. A QUANTITATIVE STUDY OF THE PROBLEM OF THE MULTIPLE NATURE OF VITAMIN B. Jour. Biol. Chem. 75: 207–212, illus. (Abstract in Expt. Sta. Rec. 58: 295–296.)

VITAMIN C TECHNIC

GOETTSCH, M.
1928. THE DETERMINATION OF THE ANTISCORBUTIC VALUE OF FOODSTUFFS BY HÖJER'S METHOD. Quart. Jour. Pharm. 1: 168–177, illus. (Abstract in Expt. Sta. Rec. 60: 691.)
HÖJER, A.
1926. METHOD FOR DETERMINING THE ANTISCORBUTIC VALUE OF A FOODSTUFF BY MEANS OF HISTOLOGICAL EXAMINATION OF THE TEETH OF YOUNG GUINEA PIGS. Brit. Jour. Expt. Path. 7: 356–360, illus. (Abstract in Expt. Sta. Rec. 57: 295.)
SHERMAN, H. C.
1926. CHEMISTRY OF FOOD AND NUTRITION. Ed. 3, rewritten and enl., p. 424–426. New York.
——— LAMER, V. K., and CAMPBELL, H. L.
1922. THE QUANTITATIVE DETERMINATION OF THE ANTISCORBUTIC VITAMIN (VITAMIN C). Jour. Amer. Chem. Soc. 44: 165–172, illus. (Abstract in Expt. Sta. Rec. 46: 865.)

VITAMIN D TECHNIC

ADAMS, G., and MCCOLLUM, E. V.
1928. A METHOD FOR THE BIOLOGICAL ASSAY OF COD-LIVER OIL. Jour. Biol. Chem. 78: 495–524. (Abstract in Expt. Sta. Rec. 60: 296.)
BETHKE, R. M., STEENBOCK, H., and NELSON, M. T.
1923. FAT-SOLUBLE VITAMINS. XV. CALCIUM AND PHOSPHORUS RELATIONS TO GROWTH AND COMPOSITION OF BLOOD AND BONE WITH VARYING VITAMIN INTAKE. Jour. Biol. Chem. 58: 71–103, illus. (Abstract in Expt. Sta. Rec. 51: 68–69.)

BILLS, C. E., and MCDONALD, F. G.
1926. ANTIRICKETIC SUBSTANCES. IV. THE POLYMERIZATION OF CHOLESTEROL. Jour. Biol. Chem. 68: 821–831, illus. (Colored plates of line test.) (Abstract in Expt. Sta. Rec. 56: 10.)

——— HONEYWELL, E. M., and MACNAIR, W. A.
1928. ANTIRICKETIC SUBSTANCES. VII. BIOCHEMICAL AND SPECTROSCOPIC STUDIES ON PURIFIED CHOLESTEROL. Jour. Biol. Chem. 76: 251–261, illus. (Abstract in Expt. Sta. Rec. 58: 795–796.)

CHICK, H.
1926. SOURCES OF ERROR IN THE TECHNIQUE EMPLOYED FOR THE BIOLOGICAL ASSAY OF FAT-SOLUBLE VITAMINS. Biochem. Jour. 20: [119]–130, illus. (Abstract in Expt. Sta. Rec. 55: 893.)

——— and ROSCOE, M. H.
1926. THE ANTI-RACHITIC VALUE OF FRESH SPINACH. Biochem. Jour. 20: [137]–152. (Abstract in Expt. Sta. Rec. 55: 891–892.)

——— KORENCHEVSKY, V., and ROSCOE, M. H.
1926. THE DIFFERENCE IN CHEMICAL COMPOSITION OF THE SKELETONS OF YOUNG RATS FED (1) ON DIETS DEPRIVED OF FAT-SOLUBLE VITAMINS AND (2) ON A LOW PHOSPHORUS RACHITIC DIET, COMPARED WITH THOSE OF NORMALLY NOURISHED ANIMALS OF THE SAME AGE. Biochem. Jour. 20: [622]–631. (Abstract in Expt. Sta. Rec. 56: 89.)

COWARD, K. H.
1928. A METHOD OF ASSAY OF THE ANTIRACHITIC VITAMIN D. Quart. Jour. Pharm. 1: 27–33, illus. (Abstract in Expt. Sta. Rec. 59: 689.)

——— and CAMBDEN, M. R.
1929. THE INFLUENCE OF CHANGES IN BODY WEIGHT OF THE TEST RATS ON THE ACCURACY OF THE ASSAY OF VITAMIN D BY MEANS OF THE LINE TEST. Quart. Jour. Pharm. and Pharmacol. 2: 44–47.

DUTCHER, R. A., CREIGHTON, M., and ROTHROCK, H. A.
1925. VITAMIN STUDIES. XI. INORGANIC BLOOD PHOSPHORUS AND BONE ASH IN RATS FED ON NORMAL, RACHITIC, AND IRRADIATED RACHITIC DIETS. Jour. Biol. Chem. 66: 401–407, illus. (Abstract in Expt. Sta. Rec. 55: 387.)

KARELITZ, S., and SHOHL, A. T.
1927. RICKETS IN RATS. I. METABOLISM STUDIES ON HIGH CALCIUM-LOW PHOSPHORUS DIETS. Jour. Biol. Chem. 73: 655–664. (Abstract in Expt. Sta. Rec. 57: 490–491.)

MCCOLLUM, E. V., SIMMONDS, N., BECKER, J. E., and SHIPLEY, P. G.
1922. STUDIES ON EXPERIMENTAL RICKETS. XXIII. THE PRODUCTION OF RICKETS IN THE RAT BY DIETS CONSISTING ESSENTIALLY OF PURIFIED FOOD SUBSTANCES. Jour. Biol. Chem. 54: 249–252. (Abstract in Expt. Sta. Rec. 48: 761.)

——— SIMMONDS, N., BECKER, J. E., and SHIPLEY, P. G.
1925. STUDIES ON EXPERIMENTAL RICKETS. XXVI. A DIET COMPOSED PRINCIPALLY OF PURIFIED FOODSTUFFS FOR USE WITH THE "LINE TEST" FOR VITAMIN D STUDIES. Jour. Biol. Chem. 65: 97–100. (Abstract in Expt. Sta. Rec. 54: 295.)

——— SIMMONDS, N., SHIPLEY, P. G., and PARK, E. A.
1922. STUDIES ON EXPERIMENTAL RICKETS. XVI. A DELICATE BIOLOGICAL TEST FOR CALCIUM-DEPOSITING SUBSTANCES. Jour. Biol. Chem. 51: 41–49, illus. (Abstract in Expt. Sta. Rec. 47: 566–567.)

——— SIMMONDS, N., SHIPLEY, P. G., and PARK, E. A.
1922. STUDIES ON EXPERIMENTAL RICKETS. XXII. CONDITIONS WHICH MUST BE FULFILLED IN PREPARING ANIMALS FOR TESTING THE ANTIRACHITIC EFFECT OF INDIVIDUAL FOODSTUFFS. Bul. Johns Hopkins Hosp. 33: 296–302. (Abstract in Expt. Sta. Rec. 48: 564.)

MUNSELL, H. E., and BLACK, H.
1928. THE "ASSAY OF A SO-CALLED COD-LIVER OIL EXTRACT" FOR VITAMIN A CONTENT AND CALCIFYING PROPERTIES COMPARED TO COD-LIVER OIL. Jour. Amer. Pharm. Assoc. 17: 139–144, illus. (Abstract in Expt. Sta. Rec. 59: 492–493.)

OSBORNE, T. B., MENDEL, L. B., and PARK, E. A.
1923. EXPERIMENTAL PRODUCTION OF RICKETS WITH DIETS OF PURIFIED FOOD SUBSTANCES. Soc. Expt. Biol. and Med. Proc. 21: 87–90. (Abstract in Expt. Sta. Rec. 51: 371.)

Outhouse, J., Macy, I. G., and Brekke, V.
1928. human milk studies. v. a quantitative comparison of the antiricketic factor in human milk and cow's milk. Jour. Biol. Chem. 78: 129–144, illus. (Abstract in Expt. Sta. Rec. 59: 690.)

Poulsson, E., and Lövenskiold, H.
1928. the quantitative determination of vitamin d. Biochem. Jour. 22: [135]–141, illus. (Abstract in Expt. Sta. Rec. 59: 293.)

Sherman, H. C., and Pappenheimer, A. M.
1921. experimental rickets in rats. i. a diet producing rickets in white rats, and its prevention by the addition of an inorganic salt. Jour. Expt. Med. 34: 189–198, illus. (Abstract in Expt. Sta. Rec. 46: 165.)

——— and Stiebeling, H. K.
1929. quantitative studies of responses to different intakes of vitamin d. Jour. Biol. Chem. 83: 497–504, illus.

Shohl, A. T., Bennett, H. B., and Weed, K. L.
1928. rickets in rats. v. comparison of effects of irradiated ergosterol and cod-liver oil. Soc. Expt. Biol. and Med. Proc. 25: 551–554. (Abstract in Expt. Sta. Rec. 59: 596.)

Smith, H. H., and Chick, H.
1926. maintenance of a standardised breed of young rats for work upon fat-soluble vitamins, with particular reference to the endowment of the offspring. Biochem. Jour. 20: [131]–136. (Abstract in Expt. Sta. Rec. 55: 893.)

Soames, K. M., and Leigh-Clare, J. C.
1928. the assay of the antirachitic vitamin d. Biochem. Jour. 22: [522]–527. (Abstract in Expt. Sta. Rec. 60: 95–96.)

Steenbock, H., and Black, A.
1925. fat-soluble vitamins. xxiii. the induction of growth-promoting and calcifying properties in fats and their unsaponifiable constituents by exposure to light. Jour. Biol. Chem. 64: 263–298, illus. (Abstract in Expt. Sta. Rec. 54: 489–490.)

——— Hart, E. B., Jones, J. H., and Black, A.
1923. fat-soluble vitamins. xiv. the inorganic phosphorus and calcium of the blood used as criteria in the demonstration of the existence of a specific antirachitic vitamin. Jour. Biol. Chem. 58: 59–70, illus. (Abstract in Expt. Sta. Rec. 51: 68–69.)

Wokes, F., and Willimott, S. G.
1927. the detection and estimation of vitamin a and of vitamin d in cod-liver oil and various food products. Pharm. Jour. and Pharm. [London] (ser. 4, v. 64) 118: 752–757, illus. (Abstract in Expt. Sta. Rec. 59: 95–96.)

VITAMIN D FECES-REACTION TEST

Bacharach, A. L., and Jephcott, H.
1929. vitamin d and fecal reaction. Jour. Biol. Chem. 82: 751–758, illus.

Jephcott, H., and Bacharach, A. L.
1926. a rapid and reliable test for vitamin d. Biochem. Jour. 20: [1351]–1355, illus. (Abstract in Expt. Sta. Rec. 56: 412.)

——— and Bacharach, A. L.
1928. the quantitative estimation of vitamin d. Biochem. Jour. 22: [60]–62, illus. (Abstract in Expt. Sta. Rec. 59: 293.)

Oser, B. L.
1928. the intestinal ph in experimental rickets. Jour. Biol. Chem. 80: 487–497, illus. (Abstract in Expt. Sta. Rec. 61: 94–95.)

Redman, T., Willimott, S. G., and Wokes, F.
1927. the ph of the gastro-intestinal tract of certain rodents used in feeding experiments, and its possible significance in rickets. Biochem. Jour. 21: [589]–605, illus. (Abstract in Expt. Sta. Rec. 57: 789.)

Shohl, A. T., and Bing, F. C.
1928. rickets in rats. ix. ph of the feces. Jour. Biol. Chem. 79: 269–274. (Abstract in Expt. Sta. Rec. 60: 494–495.)

ZUCKER, T. F., and MATZNER, M. J.
1924. ON THE PHARMACOLOGICAL ACTION OF THE ANTI-RACHITIC ACTIVE PRINCIPLE OF COD-LIVER OIL. Soc. Expt. Biol. Med. Proc. 21: 186–187. (Abstract in Expt. Sta. Rec. 51: 464–465.)

VITAMIN E TECHNIC

EVANS, H. M., AND BURR, G. O.
1927. THE ANTISTERILITY VITAMINE FAT SOLUBLE E. Calif. Univ. Mem. vol. 8. 176 p., illus. Berkeley, Univ. Calif. Press. (Abstract in Expt. Sta. Rec. 58: 595.)

——— and BURR, G. O.
1927. VITAMIN E. II. THE DESTRUCTIVE EFFECT OF CERTAIN FATS AND FRACTIONS THEREOF ON THE ANTISTERILITY VITAMIN IN WHEAT GERM AND IN WHEAT GERM OIL. Jour. Amer. Med. Assoc. 89:1587–1590. (Abstract in Expt. Sta. Rec. 58: 494–495.)

SURE, B.
1924. DIETARY REQUIREMENTS FOR REPRODUCTION. II. THE EXISTENCE OF A SPECIFIC VITAMIN FOR REPRODUCTION. Jour. Biol. Chem. 58: 693–709, illus. (Abstract in Expt. Sta. Rec. 51: 563–564.)

———
1927. DIETARY REQUIREMENTS FOR REPRODUCTION. XI. THE POTENCY OF BUTTER FAT IN VITAMIN E. Jour. Biol. Chem. 74: 71–84. (Abstract in Expt. Sta. Rec. 57: 897–898.)

WADDELL, J., and STEENBOCK, H.
1928. THE DESTRUCTION OF VITAMIN E IN A RATION COMPOSED OF NATURAL AND VARIED FOODSTUFFS. Jour. Biol. Chem. 80: 431–442, illus. (Abstract in Expt. Sta. Rec. 61: 95.)

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

October 11, 1929

Secretary of Agriculture	ARTHUR M. HYDE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	A. F. WOODS.
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension	C. W. WARBURTON.
Director of Personnel and Business Administration.	W. W. STOCKBERGER.
Director of Information	M. S. EISENHOWER.
Solicitor	R. W. WILLIAMS.
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	R. Y. STUART, *Chief.*
Bureau of Chemistry and Soils	H. G. KNIGHT, *Chief.*
Bureau of Entomology	C. L. MARLATT, *Chief.*
Bureau of Biological Survey	PAUL G. REDINGTON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Bureau of Agricultural Economics	NILS A. OLSEN, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Plant Quarantine and Control Administration.	C. L. MARLATT, *Chief.*
Grain Futures Administration	J. W. T. DUVEL, *Chief.*
Food, Drug, and Insecticide Administration	WALTER G. CAMPBELL, *Director of Regulatory Work, in Charge.*
Office of Experiment Stations	E. W. ALLEN, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*

This circular is a joint contribution from

Office of Experiment Stations	E. W. ALLEN, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*